THE MONTHLY

Review

Merry Christmas

DECEMBER • • • 1947

A Holiday Remembrance and

Thanks
To Our Many Friends

At this joyful season our thoughts turn gratefully to those whose good-will and courtesy have made possible our growth and progress. We extend to you and to yours our cordial Christmas Greetings.

Frederick Gumm

FREDERICK **GUMM** *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.

ALUMON

A PROCESS FOR ELECTROPLATING UPON ALUMINUM

"ALUMON" is a simple process for preparing aluminum for plating. Aluminum is cleaned, acid dipped and then immersed for about 1 minute in the "Alumon" solution at room temperature. A zinc alloy film is deposited that serves as a base for plating almost any metal including copper, nickel, silver, cadmium, zinc and tin.

"ALUMON" is a practical, production proven process in use in several hundred plants for plating jewelry, hardware, camera parts, chairs, automobile parts, engine cylinders, lamps, flashlights, buckles, buttons and plumbing goods. Barrel plating is possible for solid aluminum.

Samples of work plated and operating cycle determined free of charge.

The gleaming elegance of the chromed vacuum jug parts shown above, reflects a lustre that can be consistently obtained when the base aluminum is pretreated with ALUMON.

ENTHONE, INC.

442 Elm Street

New Haven 2, Conn.

METAL FINISHING CHEMICALS · ELECTROPLATING EQUIPMENT

Filter All Plating Solutions Faster, More Completely in

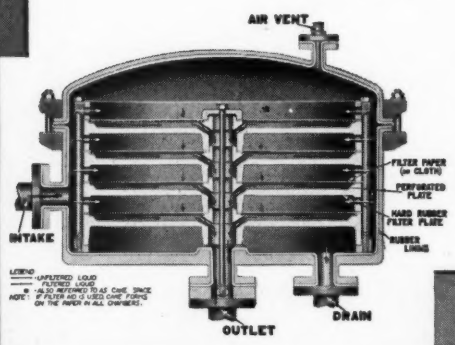
SPARKLER
Horizontal Plate
FILTERS

Because the filter cake is held horizontally, it is absolutely stable to the end of each filtering cycle. And cycles are longer because the cake retains its porosity longer. That is why the "horizontal principle," as embodied in Sparkler filters, gives you more efficient, low cost, operation. Sparkler filters are pressure-tight and leak-proof, designed for intermittent or continuous operation.

4 Plating Solution Types

1. Rubber-lined for bright nickel
2. Stainless steel for acids
3. All Iron for alkaline solutions
4. All Steel (with Stainless Pump) for chromium

SPARKLER MANUFACTURING CO.
Mundelein, Illinois



Made in Capacities
60 to 10,000 G.P.H.

See your supplier or Write for details

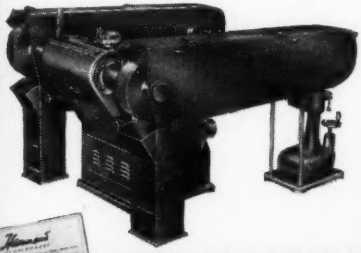
Our Engineering Service is available for any specialized problems.

IS YOUR FINISHING ROOM STILL IN THE "GAY 90's"?

Hammond of KALAMAZOO

BACKSTANDS

Hundreds of plants, large and small, have materially stepped up finishing production by converting their wheel grinding and polishing equipment to high-production abrasive belt units with Hammond Backstands. Modernize your finishing department this quick, easy economical way. Write today for literature!



WRITE FOR CATALOG 55

Shows Hammond Backstands, Polishing Lathes, Abrasive Belt and Automatic Finishing Machinery. Write today!

Hammond Machinery Builders INC.

1613 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

Greetings

1947

is drawing to a close, and we take this opportunity to express our appreciation to all our customers and friends for the many favors which we have received during the past twelve months.

1948

is dawning, and it is our earnest desire to continue our friendly relations with you . . . in the twelve months ahead it will be our aim to serve you both faithfully and expeditiously

The Symbol of Quality

STEVENS EVERYTHING IN PLATING POLISHING

FREDERIC B. STEVENS INCORPORATED

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THE MONTHLY

Review

VOLUME 34 DECEMBER, 1947 NUMBER 12

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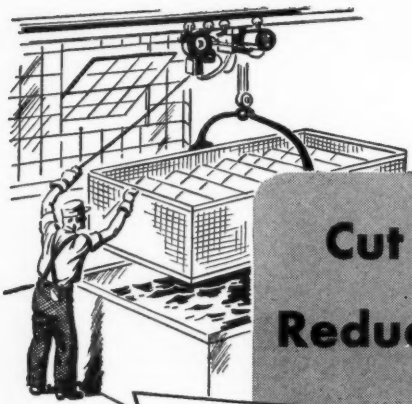

Cut Cleaning Time
and
Reduce Cleaning Costs
with

Cowles
SOAKLEEN
Liquid Emulsion Cleaner

COWLES TECHNICAL SERVICE
gladly furnished upon request.

Cowles SOAKLEEN does a real job of removing stubborn soil and oils from metal parts in pre-soak cleaning. All following cleaning operations are reduced to a minimum.

SOAKLEEN works unusually well for cleaning steel before enameling, plating and other finishes.

SOAKLEEN is simple and easy to use, is non-toxic, cuts cleaning time and reduces cleaning costs. Place a trial order today—orders shipped promptly from convenient warehouse stocks.

Package—55 gal. non-returnable steel drums.

The Cowles Detergent Company

METAL CLEANER DEPARTMENT
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PROTECTION

for your tanks
for your plant equipment
for your profits

DETERIORATION of plating tank cycles through corrosion takes its toll from operating profits. The best protection lies in defensive preparation—installing tanks of Storts design and Stortswelded construction—to retard and minimize the rate of destruction by corrosive agents—not forgetting to protect adjoining plant equipment by providing suitable and adequate exhaust facilities to carry away corrosive vapors. This combined protection is the formula for longest life value at least cost.

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42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specification

Codman

*Ventilated NON-FRAY BUFFS

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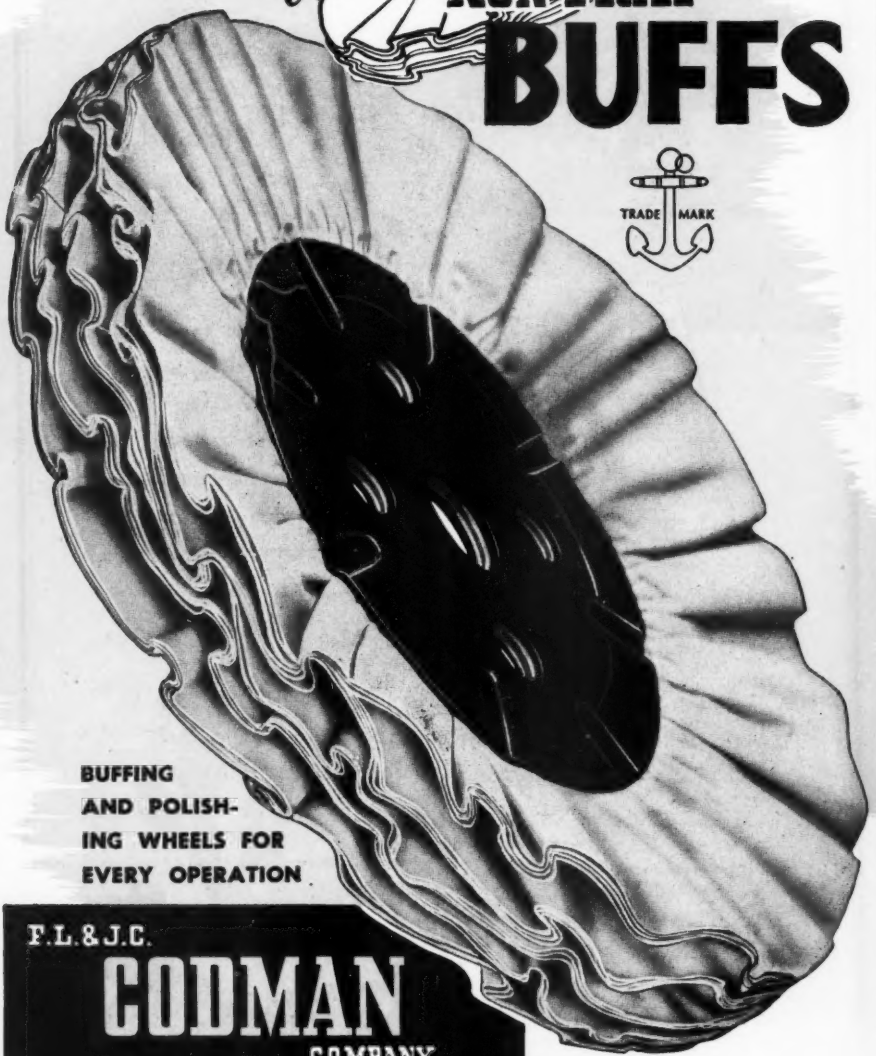

BUFFING AND POLISHING WHEELS FOR EVERY OPERATION

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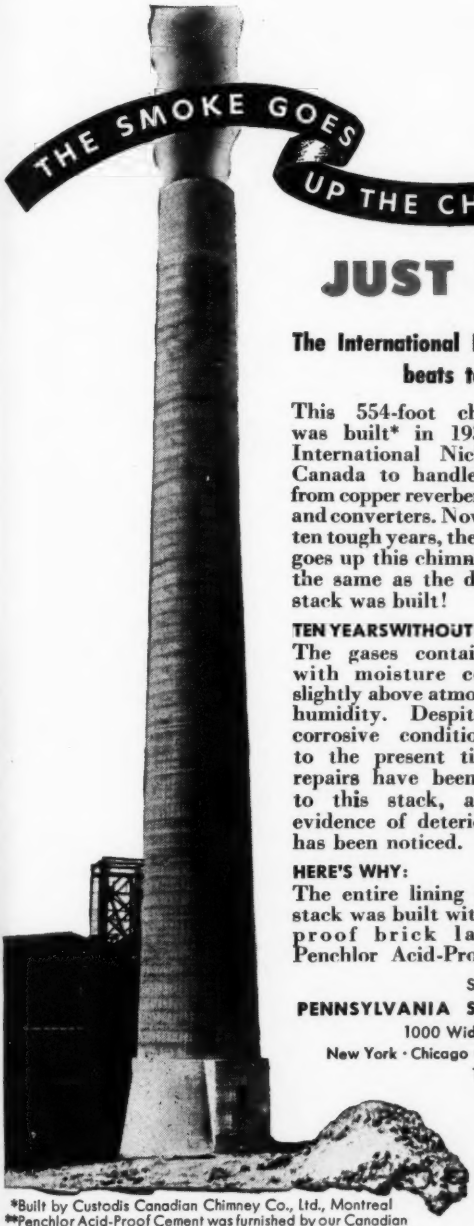

JUST THE SAME!

The International Nickel Company of Canada, Limited beats tough corrosion condition

This 554-foot chimney was built* in 1936 for International Nickel of Canada to handle gases from copper reverberatories and converters. Now, after ten tough years, the smoke goes up this chimney just the same as the day the stack was built!

TEN YEARS WITHOUT REPAIR

The gases contain SO_2 with moisture content slightly above atmospheric humidity. Despite this corrosive condition, up to the present time no repairs have been made to this stack, and no evidence of deterioration has been noticed.

HERE'S WHY:

The entire lining of this stack was built with acid-proof brick laid in Penchlor Acid-Proof Cement.** In addition, the top fifty feet of this stack was further protected by using Penchlor Acid-Proof Cement for pointing the outside surface joints. Penchlor Acid-Proof Cement is a superior sodium silicate cement that is quick-setting and self-hardening. Its outstanding record of satisfactory service has been proved in chemical plants, steel mills, paper and pulp mills, oil refineries and smelting plants.

SEND FOR CASE REPORT

If you have a corrosion problem, you'll be interested in further details about this Penchlor installation, as well as an illustrated brochure on Penchlor. Write for Case Report Number 66-2.

Special Chemicals Division

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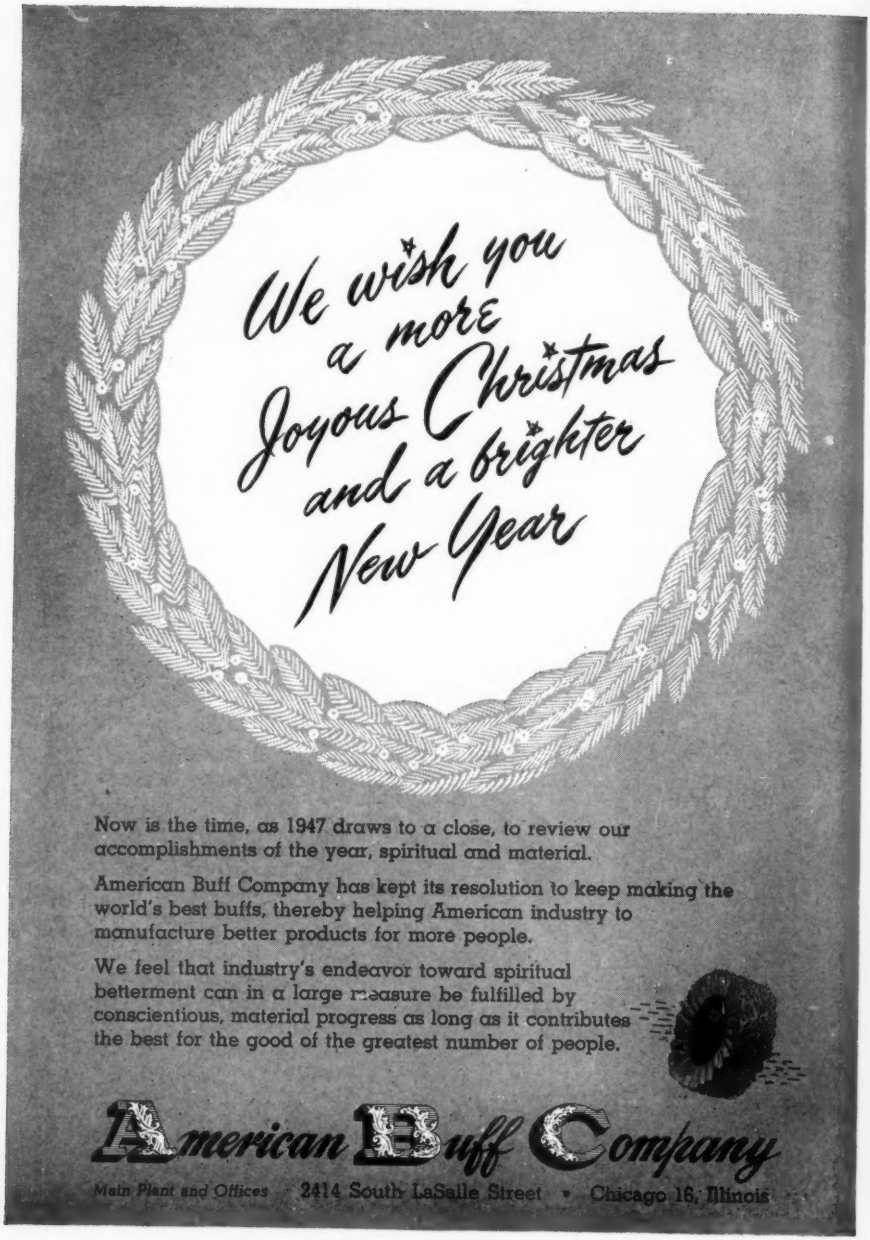
CHEMICALS

97 Years' Service to Industry

*Built by Custodis Canadian Chimney Co., Ltd., Montreal
**Penchlor Acid-Proof Cement was furnished by our Canadian Associates, G. F. Sterne & Sons, Ltd., Brantford, Ontario


We wish you
a more
Joyous Christmas
and a brighter
New Year
Now is the time, as 1947 draws to a close, to review our accomplishments of the year, spiritual and material.
American Buff Company has kept its resolution to keep making the world's best buffs, thereby helping American industry to manufacture better products for more people.
We feel that industry's endeavor toward spiritual betterment can in a large measure be fulfilled by conscientious, material progress as long as it contributes the best for the good of the greatest number of people.
American Buff Company
Main Plant and Offices · 2414 South LaSalle Street · Chicago 16, Illinois

Handle The Small Lots Faster At Less Cost

LASALCO'S

Utility Barrel Plater

No matter what the grade or type of material—no matter what the process—Lasalco's versatile Utility Barrel Plater can do it better and more uniformly with greater speed and greater economy.

★ Easy to load and unload because of its extreme portability.

★ Rugged, durable, long-life operation is guaranteed by its heavy canvas base Bakelite construction.

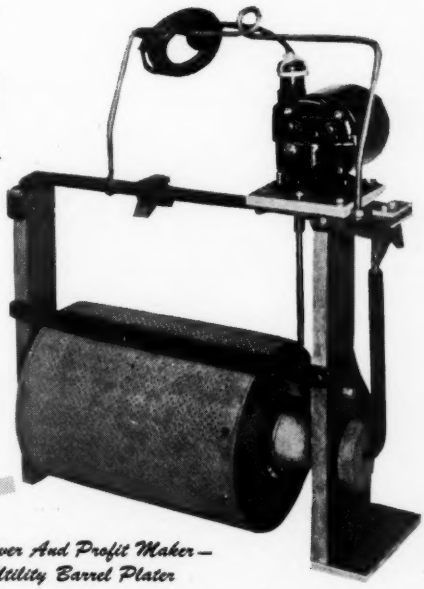
★ Can be hung in any plating tank on the cathode rod and operated from the nearest light socket.

★ Less dragout loss because barrel revolves as it is lifted from solution.

★ Nothing plates but the load – no "tree-up" on the cylinder.

★ Specially designed, sturdy, geared-type motor.

★ Cylinder sizes: No. 1—Dia. 6" x 12" long; No. 2 – Dia. 9" x 12" long.



MEMO
Call a Lasalco Engineer

It's A Time Saver And Profit Maker—Lasalco's Utility Barrel Plater

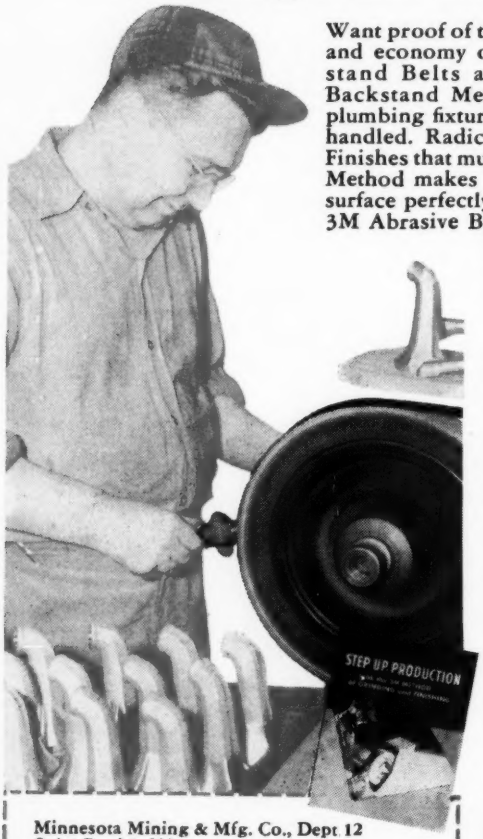
Write For Catalog Page

LASALCO, INC.

2818-38 LA SALLE STREET ST. LOUIS 4, MISSOURI

TYPICAL EXAMPLE:

Production boosted... Grinding costs slashed 40%



Want proof of the versatility and economy of 3M Backstand Belts and the 3M Backstand Method? Take plumbing fixtures. Soft metals that must be carefully handled. Radical contours that are hard to reach. Finishes that must be near-perfect. The 3M Backstand Method makes it possible to reach and finish every surface perfectly while the uniform cutting action of 3M Abrasive Belts keeps final buffing costs at rock bottom. In one typical shop, 3M Backstand Belts have stepped up production, *chopped costs 40%, reduced rejects by half.*

3M service, however, goes further than the manufacture of good Backstand Belts. 3M Abrasive Engineers go out into the field — and develop better ways to use them to slash your production costs. Manufacturers in every field come to us with finishing problems and we work with them in their own shops to find practical answers.

In fact, you can get a whole bookful of answers by sending the coupon. And if you have a problem that calls for more than that, get in touch with your 3M Distributor or ask us to have a 3M Abrasives Engineer check into things for you. It'll be a pleasure.

Minnesota Mining & Mfg. Co., Dept 12
Saint Paul 6, Minn.

Please send me a free copy of your booklet "Step Up Production"

Name.....

Address.....

City..... *Zone*.. *State*.....

3M
BACKSTAND BELTS

ANOTHER 3M COMPANY PRODUCT

Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
Saint Paul 6, Minn.

MICCROTEX

AIR-DRY RACK COATING

MICCROTAPE — An extruded tape with tapered edge to permit smoother overlapping and closer fit around shoulders. Unaffected through all plating cycles.

MICCROTUBE — An extruded tubing for use on straight or bent contact wires, also round splines. Fuses with Miccrotape into a perfect leakproof coating.

☆

✓Check THESE BASIC FEATURES:

MICCROTEX is a superior thermoplastic insulating material developed by experienced platers.

MICCROTEX meets the requirements of all plating cycles and phosphate coatings.

MICCROTEX may be dipped, brushed or sprayed with equal effect.

MICCROTEX is a black material with a high luster — highly resistant to plating solutions, acids and alkaline cleaners at boiling temperatures.

MICCROTEX is tough, resilient, and flexible — attains maximum adhesion without shrinkage.

MICCROTEX effectively minimizes dragout — is easy to use — saves time and material in application.

MICCROTEX is blazing a new trail in plating techniques . . . answering the great need for an air-dry rack coating that overcomes the difficulties commonly found in applying lacquers. Try it!

MICHIGAN CHROME
and Chemical Company
6340 East Jefferson Avenue • Detroit 7, Michigan

MICCRO Products

Developed and Manufactured by Experienced Platers

* footnote on good shop-keeping

If you want to keep your shop looking clean, start from the floor up. Use Wyandotte Zorball, the *all-purpose* floor absorbent, to remove oil, grease, water and other liquids or combinations of liquids quickly and efficiently.

Zorball gives an immediate anti-skid surface to soiled floors, thus reducing the danger of slipping accidents. And it is non-flammable. Even when soaked with oil, it will not readily support combustion.

Zorball is safe, too. It is harmless to fabrics, metals and rubber, and to the skin of those who handle it.

Your Wyandotte Representative will be glad to demonstrate the effectiveness and economy of Wyandotte Zorball. Why not give him a call today?

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

Amazing new white finish saves cost of Porcelain!

Useful on steel surfaces; also on aluminum to save scarce steel!

Approaches porcelain in resistance to stains and scratches; better than porcelain in chip-resistance, flexibility and economy of application.

Zapon DURANITE-H

is ideal for finishing metal products wherever brilliant lustre, permanence, toughness and stain-resistance are desired—refrigerator interiors, electrical appliances, metal cabinets, display signs, wall tile, fire extinguishers, food handling equipment, photographic equipment, aluminum sinks, hot water heaters, washing machines, tubs and various parts.

This *really new* finish is based on a new organic resin development. It is far superior to any urea and melamine modified alkyd enamel on the market. Thus it fills a real need for an economical finish with properties approaching porcelain.

In laboratory tests Duranite-H is not affected by acetic, citric, oleic or lactic acids; — nor by vegetable, animal or petroleum greases. It shows no signs of failure after 2208 hours in 3%—Gold Dust at 120° F.;—after 3096 hours in 100% humidity at 120° F.;—after 1250 hours in 20% salt spray test at 95° F. In the pencil hardness test this enamel was rated 5H to 6H.

For application on steel, a Duranite-H primer gives maximum adhesion, flexibility and impact resistance. One coat on aluminum, after special preparation, gives exceptionally fine qualities. Duranite-H on surface-treated magnesium also gives a superior finish.

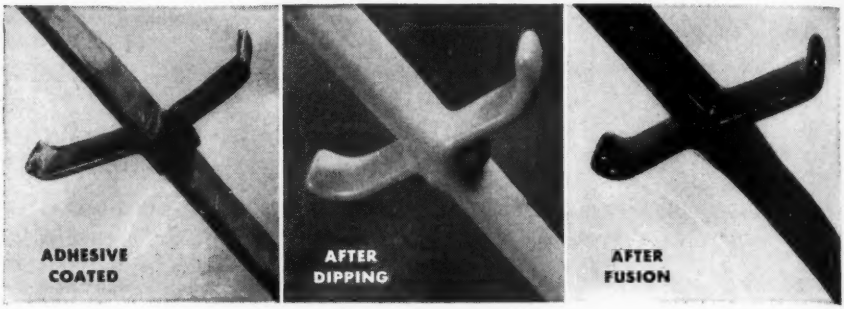
Now formulated for spraying, variations permit dipping or roller-coating. Required reduction is three parts Duranite-H to one part xylol. Recommended baking schedule is 30 minutes at 420° F.

Write, wire or phone for quick service and a demonstration of Duranite-H White Enamels (colors to be introduced soon). Zapon Division, Atlas Powder Company, New York City, Stamford, Conn., and North Chicago, Illinois.

ZAPON REG. U. S. PAT. OFF.

zapon production finishes

NEW RACK COATING BUILDS ¼" THICKNESS IN A SINGLE DIP



Tygoflex Plastic Handles All Plating Solutions *(including alkaline cleaners)* up to 230° F.

Thickness up to ¼" in a single dip . . . effective resistance to all plating solutions . . . resists salts pick-up . . . upper temperature limits up to 230°F. . . . bonds tightly to steel, copper, brass . . . these are just a few of the properties of Tygoflex, U. S. Stoneware's new liquid plastic protective coating.

Tygoflex (a creamy, viscous, solvent-free liquid plastic) is applied by dipping or brushing. When fused under heat (350°F. for 15 to 30 minutes), Tygoflex converts to a tough, black material resembling in appearance and physical characteristics a glossy live rubber compound of medium hardness. Only one dip is required.

MEETS ALL BASIC REQUIREMENTS

Tygoflex protects racks through all metal finishing operations . . . is unaffected by temperature changes. Tygoflex is unusually tough . . . withstands severe mechanical abuse . . . is easily repaired if damaged. High dielectric strength keeps down current losses. The glossy surface minimizes dragout.

Write for free miniature test rack and Bulletin R-16A

U. S. STONEWARE
Akron 9, Ohio

Use
TYGOFLEX

To Protect:

Plating racks
Dipping baskets
Plating tanks
Tank grids
Bus bars
Pickling hooks
Plating barrels
Pipe
Thermometer wells
Fans and housings
Fume ducts
Valve Bodies
Filters
Drying equipment
Rollers
Tools, control handles

When Exposed to:

Electroplating solutions
Pickling
Descaling
Electro cleaning
Electrolytic polishing
Hydrofluoric acid etching
Electrical currents
Mechanical abuse
Anodizing
Bonderizing
Phosphatizing
Dichromatizing
Etching solutions
Alkaline cleaners

New Slant on Plating

A close investigation of your plating operations can show a reduction in finishing cost without jeopardizing the quality of the work. There is that possibility. Here's a thought along that line and an offer.

Udylite, using its modern technical facilities and trained staff, will make this investigation for you at no cost to you and in accordance with a plan that has proved to be very practicable.

First
a preliminary survey of your operations is made by one of Udylite's field engineers.

Then
a complete analysis including laboratory work is conducted by Udylite engineers and electrochemists at headquarters in Detroit.

Finally
a full written report which includes all findings and whatever recommendations may be justified is turned over to you. You may then take whatever action you choose. It does not obligate you.

Udylite ***First in the Field of Metal Finishing***

THE UDYLITE CORPORATION

DETROIT 11, MICHIGAN

REPRESENTED IN PRINCIPAL CITIES

Improved Plating-

WITH SARCO

Controlled temperatures mean uniform, high quality plating, day in and out. Yon can control wash tank temperatures with the Sarco "87" at a cost of a few dollars. Most plating tanks can be controlled with the Sarco "LSI" electric control which costs much less than most methods. For special and highly accurate controls for vapor-line and heating and cooling there are a dozen different Sarco combinations. Four types of Sarco Steam Traps help reduce fuel costs.

SARCO CATALOGS

No. 1025
LSI Electric Control

No. 700
TR-40 Cooling Control

No. 650
Vapor-Line Control

No. 600
Tank Temperature Controls

No. 550
87 Trap-Control

Nos. 350 & 450
Bucket, Thermostatic and Float-Thermostatic Steam Traps

No. 1200
Pipe Line Strainers

ASK FOR THE SARCO CATALOGS ON PLATING

219

SARCO SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
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LININGS
TO FIT THE JOB

Heil Process Specialists have no soft spot for any single lining or insulating material. They know that temperature, abrasion, absorption and contamination are factors that affect all choices. They recommend and supply the lining best suited to the needs of the process. The lining is installed separately or as part of the complete job.

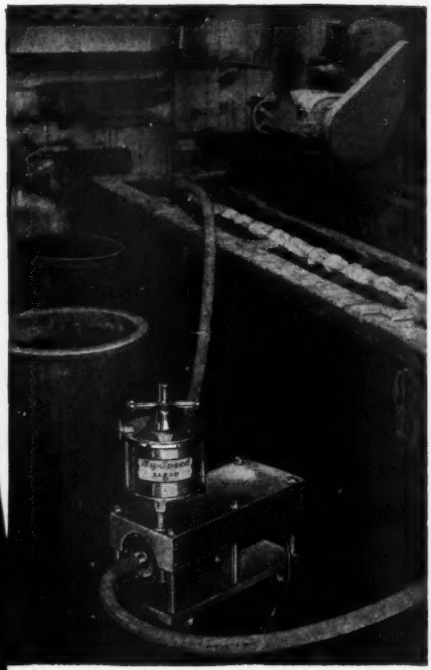
Heil experience in chemical proof construction includes the fabrication, lining, coating and assembly of all types of tanks, ducts, tank heaters, linings and fixtures built to your specifications. Complete job, one cost, one responsibility, one delivery date. Write for Bulletin.

HEIL PROCESS EQUIPMENT CORP.
12901 Elmwood Avenue • Cleveland 11, Ohio

Jobbers investigate Heil fabricating and lining service

HEIL CHEMICAL PROOF EQUIPMENT
ANODES • TANKS • DUCTS • TANK FIXTURES • HEATERS • COATINGS • LININGS . . . fabricated to your specifications

The FILTER that Plating Shop Men Are Buying... ...ON ITS REPUTATION



Outstanding for protection against pitting, spotting, poor adhesion, formation of nodules, etc., which mean rejects and reworking, "*Sealed-Disc*" Filters have won high reputation in plating rooms large and small all over the world.

You too, can take advantage of the savings in time and labor by using an Alsop "*Sealed-Disc*" Filter in your plant.

"*Sealed-Disc*" Filters remove all traces of dirt, dust, oil, sludge and all other impurities from plating solutions. They are light, compact, portable and easy to move from one tank to another for instant use.

Our new catalog gives you all the facts.

The Alsop Engineering Corporation, 212 Fine Street, Milldale, Connecticut

SEND FOR THIS NEW CATALOG

Write for your copy of P-347 which tells exactly how, why and where "*Sealed-Disc*" Filters can help you get finer finished plated work from your plating solutions.

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Filters, Filter Discs, Pumps, Tanks, Mixers, Agitators

THE MONTHLY
Review

EDITORIAL

Branch Exhibits at the Industrial Finishing Exposition

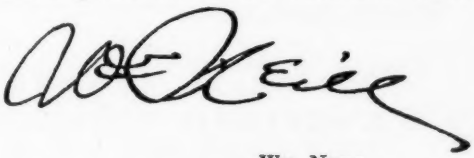
For almost seven years of war and reconversion the work of the Exhibits Committees has been beset by a multitude of difficulties. The membership is fully aware of the many problems which were faced during that time, and that, in spite of them, exhibits of interest and educational value were collected.

By this time, the plating industry has set its house in order and is again producing the many plated and finished parts which had practically disappeared from the market. Many methods and processes developed during the war are still being used without change, or in only slightly modified form for the production of peacetime articles. For these reasons the members of the Society should again put forth an all-out effort to display their handiwork.

Since the manufacturers of plating and allied equipment and supplies will exhibit the tools with which platers and finishers do their work, it is particularly fitting that the latter get together and show what they can accomplish by combining these tools and their own ingenuity.

The Exhibits Committee urges every member to prepare actively to push toward the goal it has set up: "An Exhibit from Every Branch."

The Branch secretaries will be notified of the details very soon. It is the Committee's earnest wish that Branch Committees be organized to see to it that the many interesting results of their members' craftmanship be displayed.



WM. NEILL,
Exhibits Chairman.

BUT . . .

His plodding—time-consuming—methods would be as hopelessly outdated as old fashioned ways of cleaning metals.

Duridine*

used in power spray washers of mild steel, provides modern metal cleaning and phosphate-coating that is rapid—effective—economical. It removes oil, grease and other foreign surface matter—phosphatizes—changes the surface to a non-conductive phosphate film of uniform crystalline consistency. "DURIDINE" establishes a lasting adhesive bond for paint finishes. In addition, this bond prevents rust encroachment when painted surfaces are accidentally scratched or dented.

For proper cleaning and effective phosphatizing of metal surfaces—specify "DURIDINE".

*® for Metal Cleaning and Coating Chemicals

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING

Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING

Deoxidine *
Peroline *

PICKLING ACID INHIBITORS

Rodine * ®

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

FATIGUE LIMIT OF CHROMIUM PLATED STEEL

LOUIS MEHR, T. T. OBERG, AND J. TERES

Materials Laboratory, Air Materiel Command
Army Air Forces, Wright Field, Dayton, Ohio

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SUMMARY

A survey of the literature of chromium plating and its effect on fatigue resistance has shown wide discrepancies. The information was limited in detail and quantity.

The purpose of this investigation was twofold:

(a) A systematic study and evaluation of the effect of the possible variables on the fatigue limit.

(b) The development of a process which would cause such a low fatigue loss that the necessity for testing each plated part could be dispensed with. This latter objective was not completely realized, but several desirable conditions were established.

The minimum reduction in fatigue strength for chromium plating to 0.001 inch in thickness without the use of nitriding was approximately 8%. Reductions as high as 50% for 0.001 inch thick coatings were found under unfavorable conditions.

The optimum conditions for high fatigue strength were found with plate applied at 55° C (131° F) in the upper end of the bright plating range. The least favorable condition was obtained at low current densities in the 70° C (158° F) bath. In general, at a particular temperature, the higher the current density, the less is the reduction in fatigue properties, and the lower the current density, the greater is the reduction.

Baking after plating to remove hydrogen embrittlement reduced the fatigue limit in a number of instances. Similar effects have been reported by Wiegand and Scheinost.[1]

A treatment prior to plating may have a profound effect. Beneficial results were obtained by nitriding the steel prior to plating, but electrolytic polishing produced a marked decrease in the fatigue limit of the steel.

All coatings tested in this investigation were deposited from the conventional dilute chromic acid bath containing 250 g/l chromic acid and 0.25 g/l sulfate ion.

It is concluded that chromium plate cannot be applied indiscriminately to highly stressed areas subject to vibration. Since stresses in aircraft parts are indeterminate in most applications, each application of chromium plate should undergo a model test with a sufficient number of cycles to demonstrate its serviceability. Satisfactory completion of 30 million cycles is normally taken as insurance that the part is not operating above the fatigue limit. It is obvious that maximum plate thickness should be used in this evaluation. The number of cycles may be reduced provided it exceeds the maximum position of the knee of the S-N curve of the particular steel in the condition in which it is plated.

REPRESENTATIVE EARLIER FATIGUE WORK

Fatigue data on chromium plated steel were collected covering earlier work done at Wright Field on specimens plated by various laboratories. To these were added data com-

piled from other sources. The following information was available:

SAE 4140 Steel

Source: Plating by Ford Motor Company, fatigue tests at Wright Field

Rockwell C Hardness Prior to Plating—33

Cleaning Procedure: Alkaline electrocleaning followed by a hot water rinse and then a 20-second anodic etch in 32 oz/gal chromic acid (CrO_3) at 1.7 ampere per square inch (asi)

Plating Procedure: Plating while bar is revolving for 45 minutes in a bath consisting of 24.8 oz/gal chromic acid (CrO_3) plus 1.6 oz/gal of 35% hydrofluosilicic acid, followed by a rinse in hot water to removed adhering solution

Fatigue Test: Reversed bending in R. R. Moore rotating beam fatigue machine at 10,600 rpm

SAE 4640 Steel

Source: Plating at Wright Field

Rockwell C Hardness Prior to Plating—36

Cleaning Procedure: Organic solvent cleaning to remove grease film; anodic etching at plating current density

Plating Procedure: Fixture placed in center of geometric square made by anodes. Parts plated at 26 ± 1° C (79 ± 2° F) in 300 g/l (40 oz/gal) chromic acid (CrO_3) plus 3 g/l (0.4 oz/gal) of sulfuric acid (H_2SO_4), then rinsed in hot water. Plating conditions were such that a gray plate was obtained which duplicated the appearance of the plate on gray-chrome plated propellers

Fatigue Test: Reversed bending in R. R. Moore rotating beam fatigue machine at 3450 rpm

4340 Steel

Source: Plating by Battelle Memorial Institute, fatigue tests at Wright Field

Hardness Prior to Plating: Not available

Cleaning Procedure: Electrolytic polishing, details not obtained

Plating Procedure: Not obtained

Fatigue Test: Reversed bending in R. R. Moore rotating beam fatigue machine at 3450 rpm

SAE 6130 Steel

Source: Plating by National Bureau of Standards, fatigue tests at Naval Air Experimental Station

Rockwell C Hardness Prior to Plating—33

Cleaning Procedure: Anodic etch

Plating Procedure: Plate was applied from a bath of 33.0 to 37.0 oz/gal chromic acid (CrO_3) and 0.33 to 0.37 oz/gal sulfuric acid (H_2SO_4) at 65° C (149° F)

Fatigue Test: Reversed bending in R. R. Moore rotating beam fatigue machine

SAE 4340 Steel

Source: Plating by Van der Horst with the porous plate process, fatigue evaluation at Wright Field

Rockwell C Hardness Prior to Plating—32

Cleaning Procedure: Gasoline to remove grease film. Etching in CrO_3 solution for 30 seconds at 2 asi

Plating Procedure: Plating in 25 oz/gal of chromic acid (CrO_3) and 0.25 oz/gal of sulfuric acid (H_2SO_4), immediately followed by polarity reversal and the same current density to produce the porous effect. The bath temperature was probably 50° C (122° F).

Fatigue Test: In R. R. Moore rotating beam machine at 3450 rpm

SAE 4130 Steel

Source: Plating and testing by Naval Air Experimental Station (two series)

Rockwell C Hardness Prior to Plating—35

Cleaning Procedure: Anodic etch

Plating Procedure: Coatings were applied either at 1.4 asi and 55° C (131° F), or at 7.0 asi and 70° C (158° F) in a solution of 33.0 to 37.0 oz/gal of chromic acid (CrO_3) and 0.33 to 0.37 oz/gal of sulfuric acid (H_2SO_4)

Cr-Ni-Mo-V Steel

Source: H. Wiegand and R. Scheinost[1]

Hardness Prior to Plating: Not available

Cleaning Procedure: Not available

Plating Procedure: Plate applied at 3.2 asi and 50° C (122° F)

Fatigue Test: Probably rotating beam type

The results of this earlier work are shown in Table I.

TABLE I

Results of Earlier Fatigue Work on Chromium Plated Steel

Steel SAE No.	Plate Thickness 0.00001 in.	Current Density, asi	Post Plate Treatment	Fatigue Limit psi
4140	None	....	....	77,000
4140	97	About 1.7	205° C, 3 hr	65,000
4640	None	....	....	82,000
4640	30	0.53	None	64,000
4640	200	3.1	None	18,000
4640	30	0.53	316° C, 4 hr	73,000
4640	200	3.1	316° C, 4 hr	30,000
4340*	None	....	....	78,000
4340*	120	Probably 2.5–3.0	None	33,000
4340†	None	....	....	74,000
4340†	230	2	Current reversal	48,000
4340†	460	2	Current reversal	50 000
4340†	460	2	Current reversal 290° C, 3 hr	46,000
6130	None	....	....	65,000
6130	15	7.0	None	38,000
6130	45	7.0	None	41,000
4130	None	....	....	86,000
4130	10–20	1.4	None	74,000
4130	30–45	1.4	None	65,000
4130	200–300	1.4	None	77,000
4130	30–45	7.0	None	56,000
4130	100–200	7.0	Polished	76,000
4130	200	7.0	None	30,000
4130	200–300	7.0	None	28,000
4130	920–1100	7.0	None	40,000
4130	1500	7.0	None	35,000
4130	None	....	....	86,000
4130	50	1.8	None	80,000
4130	50	7.0	None	49,000
Cr–Ni–Mo–V	None	....	....	74,000
Cr–Ni–Mo–V	160	3.2	None	68,000
Cr–Ni–Mo–V	590	3.2	None	64,000
Cr–Ni–Mo–V	160	3.2	250° C, 2 hr	62,000
Cr–Ni–Mo–V	790	3.2	250° C, 2 hr	31,000

*Plated by Battelle. †Plated by Van der Horst.

It is evident that the plate thickness is not the only variable affecting the fatigue limit of the steel. The divergence in the nature of the steels and the pre-plating and plating conditions from those in our own tests will be shown to have had a drastic effect upon the fatigue limit.

PLAN OF INVESTIGATION

The following variables were investigated:

(a) Plating temperature as it affects current density range, hardness of plate and loss of fatigue strength.

(b) Baking and baking time in their effect

TABLE II

Physical Properties of the SAE 4340 Steel

Property	Specimen No. 1	Specimen No. 2	Average
Tensile Strength, psi	148,300	148,900	148,600
Yield Strength at 0.2% offset, psi	137,000	138,000	137,500
Elongation, %	19.0	19.0	19.0
Reduction of Area, %	58.0	58.5	58.2
Brinell Hardness, 3000 kg load	311	312	311
Izod Impact Strength, ft-lb	63, 66, 69	64.5, 65.6, 67	65.8

on loss in fatigue strength, on hardness and crack frequency.

(c) Current density at a particular bath temperature as it bears on loss in fatigue strength and on crack frequency.

(d) Nitriding of the steel in relation to notch sensitivity and loss in fatigue strength.

(e) Size of fatigue specimen.

The following factors were not investigated: Composition and hardness of the steel, composition of the chromium plating bath.

EXPERIMENTAL

History of the Steel

The materials used in the portion of this investigation dealing with fatigue were 1½ inch round bars made from SAE 4340 chromium-nickel-molybdenum steel. The mill analysis for the material was furnished by the manufacturer as follows:

C	Si	Mn	P	S	Cr	Ni	Mo
0.39	0.24	0.72	0.018	0.016	0.82	1.76	0.25

The physical properties of the steel were determined with standard tensile and Izod impact specimens and with stock bars in accordance with Federal Specification QQ-M-151a. They are listed in Table II.

Preparation of Fatigue Specimens

Approximately 175 standard R. R. Moore fatigue specimens of a diameter of 0.300 inch were prepared, also 24 specimens of a diameter of 0.800 inch. The fatigue specimens were rough machined within 1/16 inch of the finished dimensions and heat treated to a Rockwell C hardness of 32–34, then machined to the required finished dimensions. They were super-polished longitudinally to remove surface irregularities.

Nitriding

Approximately 60 fatigue specimens were subjected to nitriding in a Homo furnace for 43 hours at a temperature of 510° C (950° F) with ammonia gas as the hardening agent.

Included during the nitriding operation was a special rectangular test specimen which was used for a hardness survey of the nitrided case. The block was tapered after nitriding at a rate of 0.0266 inch in depth for every inch of length until the core was reached, and hardness values were taken every 0.0125 inch along the taper (representing successive penetrations of 0.0033 inch) by means of a Vicker's hardness testing machine with a 10 kg load. The data in Table III shows the values obtained.

V-Notched Specimens

The gauge sections of several of the polished specimens were given a 60 degree circular groove, 0.0025 inch deep, with a

TABLE III
Hardness of Nitrided Case

Case Depth inch	VPN Hardness 10 kg load
0.0000	560
0.0033	525
0.0066	506
0.0099	503
0.0132	413
0.0165	405
0.0198	390
0.0231	369
0.0264	369
0.0297	369
0.0330	351
0.0363	351
0.0396	345
Core	311

0.010 inch radius at the bottom. About half of this group was nitrided along with the unnotched specimens. The purpose of notching the specimens was to determine the notch sensitivity of the steel when nitrided and unnitrided.

Hardness and Crack Evaluation Specimens

Approximately 150 SAE 1020 steel tube specimens of ⅜ inch OD, ¼ inch ID and ½ inch height were prepared.

Plating Procedures

The cathode fixture was composed of a group of five *fatigue test specimens* with a suitable copper strap to permit clamping onto the cathodic bus-bar. The specimens were internally threaded at each end and were held tightly together by means of stud bolts. The terminal fatigue specimens were dummies which were used to facilitate even current distribution on the middle three test specimens. A photograph of the fixture is included as Fig. 1.

Fig. 1. Cathode plating fixture with transparent insulating ends. Fatigue specimens fastened together with ¼ inch, 20-thread studs

The fixture for plating the *hardness-and-crack evaluation* specimens consisted of a rod with threaded areas and nuts for holding the specimens as described below. An L-bend was made in the top of the fixture to facilitate clamping onto the cathode bus-bar. A group of 20 specimens was strung on the rod with a 2-inch long blank at each end. The specimens were brought into very close contact by means of nuts and were formed into a smooth-surfaced pseudo-cylinder by careful alignment to minimize the build-up of plate on the specimen edges.

The anode fixture consisted of four 7% antimonial lead anodes suspended from the anodic bus-bars to form the sides of an approximately 17-inch square. The cathode fixture was suspended in such a manner as to occupy the geometric center of the square.

The fatigue test and hardness-and-crack evaluation specimens were vapor degreased to remove corrosion preventive grease before insertion into the plating bath. They were then subjected to a 45-second anodic etch at the plating current density and temperature in the plating bath. This had previously been found to be essential to guarantee maximum adhesion. At the end of the 45 seconds the current was quickly reversed and plating was begun.

The plating was accomplished in the dilute chromic-sulfuric acid bath having a composition of 250 g/l chromic acid and 2.5 g/l sulfate ion. The ratio of chromic acid to sulfate ion was maintained at approximately 100/1. The plating was performed at two different bath temperatures, 55 ± 1° C (131 ± 2° F) and 70 ± 1° C (158 ± 2° F) with constant air agitation. The baths will be identified as the high and the low temperature bath respectively.

At the low bath temperature, specimens were plated at the following current densities: 0.71, 2.1, and 6.3 asi. At the high bath temperature, specimens were plated at the following current densities: 5.0, 8.6 and 13.0 asi.

The area of the five specimens that comprised the fixture, less the area of the ends of the dummy specimens which were stopped off, was 25.39 sq. in. The average current density over the entire area was determined by dividing the applied current by the area. After the completion of a plating run, the dummy specimens were stripped of their plate in a dilute hydrochloric acid pickle and re-used for the same purpose. They were discarded when pitting of the base metal became evident.

The current densities chosen were determined by the bright plating range which falls between 0.9 and 3.0 asi at 55° C and between 4.6 and 13.7 asi at 70° C. In the case of the high temperature bath, the three current density values used actually

represented the high, median and low portions of the bright range.

The current density values employed in the low temperature bath approximately represented the lower limit and median of the bright range whereas the high current density value, 6.3 asi, was well above the upper limit of the bright range. Consequently the plate applied at this current density was nodular and slightly gray. The surfaces of these particular specimens were ground and polished to a smooth finish leaving approximately 0.003 inch of chromium plate.

At the time the low temperature bath specimens were being plated, the bright range data was incomplete and the 0.71 asi and 2.1 asi values were estimates of the lower and median current density values. The 0.71 value is slightly low. All plating and bright range data determinations were made at Wright Field.

The plate thickness on the test specimens was determined by magnetic methods. The instrument was frequently calibrated against standard specimens and found to be accurate.

Post Plating Treatment

To determine the effect of baking on the fatigue limit of the chromium plated steel, duplicate sets of specimens of about the same plate thickness were subjected to an air-bake at 205° C (401° F) for sixteen hours. The specimens were placed in the oven immediately following the plating, washing and drying operation.

Fatigue Limit Determination

The fatigue tests were made in rotating beam fatigue machines at an operating speed of 3450 rpm. All fatigue values were calculated on the basis of the overall plated diameters. A photograph of a fatigue specimen section after failure is included as Fig. 2.

The fatigue limit for specimens plated under a particular set of conditions was determined from the plot of stress versus the logarithm of the number of cycles (or stress reversals) to which each specimen was subjected. If a specimen withstood approximately 20 million cycles or more, the stress was considered to be at the fatigue limit or lower.

Each fatigue value was established by test on at least 5 specimens except in one instance when 3 were employed.

Fig. 2. Typical fatigue failure in chromium plated specimens with 0.002 inch thick chromium plate. Note fatigue cracks outside fracture

Hardness and Crack Evaluation

Specimens for the evaluation of hardness and cracks in the chromium plate were divided into six groups of 20 each. One group was plated at the lower limit, one at the median and one at the upper limit of the bright current density range for each of the two bath temperature conditions. Pairs of plated specimens of each of the groups were air-baked for time intervals of 2, 6 and 16 hours at temperatures of 205° C, 316° C and 427° C, respectively. The baking treatment accounted for 18 specimens from each of the groups. The two remaining specimens from each group were left unbaked.

The hardness indentations were made on a cross-section of the plate rather than on the cylindrical surface. This gave a more accurate reading since the chromium plate itself was used as a backing rather than the comparatively soft steel core. An Eberbach micro-hardness testing machine with a diamond indentor and a 100 gram load was used in the hardness determinations.

The thickness of plate varied from 0.0021 to 0.004 inch. A magnification of 1500X and a field diameter of 0.004 inch were used

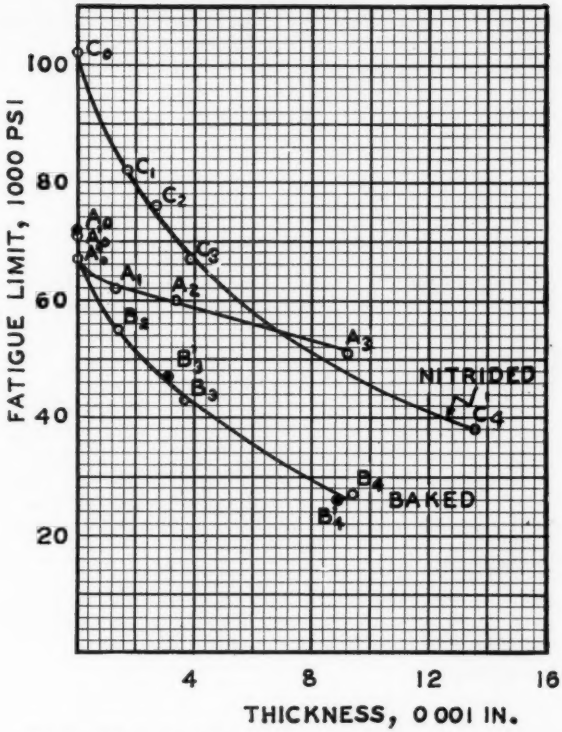

Fig. 3. Effect of plate thickness, nitriding before plating, and baking after plating on the fatigue strength of superfinished SAE 4340 steel, bright chromium plated at 55° C (131° F) and median current density of 2.1 asi

in the hardness determinations. Approximately five hardness indentations and readings were made on each specimen. The readings were made by two operators, and an average of their results was used. The values are believed to be accurate within ± 25 Eberbach VPN.

The number and nature of the cracks observed in the chromium plate per field of view were observed during the hardness evaluation. The crack count was made at 100X magnification and with a field diameter of 0.02 inch.

RESULTS

The results of the fatigue tests are shown in Tables IV and V and, in condensed form, in Figs. 3, 4 and 5.

The findings relative to crack formation, porosity and hardness are summarized in Table VI and Figs. 6 and 7.

Discussion of Results

Although a large number of tests were performed, only some variables were studied and those only within narrow limits. Hence any conclusions must be limited in scope, and one must guard against considering them of general validity.

In all cases, chromium plating lowered the fatigue resistance of the SAE 4340 steel. Part of the drop was caused by the etching of the steel (compare A''_0 with A_0) which is required to assure adhesion.

The results pictured in Figs. 3 and 4 were all obtained with chromium plating at current densities approximately in the middle of the bright plating range. With a plating temperature of 55° C (131° F), the fatigue limit was decreased as the thickness of chromium was increased, independently of whether the steel was plated directly and

TABLE IV

Fatigue Resistance of Chromium Plated, Superfinished SAE 4340 Chromium-Nickel-Molybdenum Steel

Diameter of specimens 0.300 inch except where noted.
Etching when used is for 45 seconds with specimen as anode in the plating solution.
Baking when used is for 16 hours at 205° C (400° F).
F indicates failure of specimen.

Designation	Chromium Thickness 0.00001 in.	Applied Stress 1000 psi	No. of 1000 cycles
Unplated specimens			
A_0	None	80F	252
A_0	None	80F	280
A_0	None	74F	345
A_0	None	72F	266
A_0	None	72	20,300
A_0	None	71F	497
A_0	None	71	25,500
A_0	None	70	25,000
A_0	None	70	20,000
A_0	None	70	20,200
Unplated 0.800 in. dia. specimens			
A'_0	None	100F	58
A'_0	None	90F	164
A'_0	None	74F	617
A'_0	None	72	20,000
A'_0	None	70	20,000
Unplated etched specimens			
A''_0	None	72F	519
A''_0	None	70F	460
A''_0	None	68F	1,089
A''_0	None	68	26,000
Etched specimens plated at 55°C (131°F), 2.1 asi			
A_1	143	65F	195
A_1	140	63F	214
A_1	135	62	19,750
A_1	129	62	20,500
A_1	130	62	21,500
A_2	345	62F	630
A_2	330	61F	232
A_2	340	61	24,000
A_2	330	60	21,200
A_2	335	60	25,600
A_3	940	65F	70
A_3	980	58F	987
A_3	940	55F	117
A_3	960	53F	255
A_3	960	51	25,300
A_3	940	50	10,000
Etched specimens, plated at 55° C (131° F), 0.71 asi, baked			
B_1	198	65F	101
B_1	198	50F	440
B_1	198	48F	997
B_1	195	47	22,000
B_1	193	47	20,000
B_1	193	46	19,500
Etched specimens, plated at 55° C (131° F), 2.1 asi baked			
B_2	135	65F	164
B_2	138	60F	352
B_2	133	58F	328
B_2	135	56F	950
B_2	140	55	21,500
B_2	140	55	21,340
B_3	380	65F	68
B_3	375	50F	166
B_3	490	45F	313
B_3	365	43	21,300
B_3	375	42	22,000
B_4	960	53F	70
B_4	940	40F	109
B_4	960	35F	162
B_4	960	30F	200
B_4	940	27	21,000
Etched 0.800 in. dia. specimens, plated at 55° C (131° F), 2.1 asi, baked			
B'_3	300	70F	105
B'_3	330	60F	153
B'_3	350	51F	367
B'_3	300	49F	538
B'_3	320	47	30,000
B'_4	850	50F	343
B'_4	850	38F	537
B'_4	1100	28F	555
B'_4	890	26	20,000
B'_4	890	24	20,000
Etched specimens, plated at 55° C (131° F), 6.3 asi, baked			
B_5	340	62F	220
B_5	330	60F	229
B_5	360	57F	219
B_5	310	57F	566
B_5	330	55	25,250
Unplated nitrided specimens			
C_0	None	115F	98
C_0	None	110F	332
C_0	None	105F	1,638
C_0	None	105F	4,108
C_0	None	103F	3,360
C_0	None	102	30,500
C_0	None	101	20,000

TABLE IV continued

Designation	Chromium Thickness 0.00001 in.	Applied Stress 1000 psi	No. of 1000 cycles
Nitrided and etched specimens, plated at 55° C (131° F), 2.1 asi			
C_1	150	105F	38
C_1	175	100F	58
C_1	215	96F	188
C_1	200	92F	142
C_1	245	88F	152
C_1	175	82	5,000
C_2	275	85F	146
C_2	275	82F	175
C_2	220	79F	333
C_2	210	78F	158
C_2	210	76	20,000
C_2	275	76	25,000
C_3	390	98F	10
C_3	385	70F	760
C_3	385	67	10,000
C_4	1440	76F	10
C_4	1500	60F	38
C_4	1440	40F	509
C_4	1360	38	20,000
C_4	1360	37	24,000
C_4	1380	35	20,000
Etched specimens, plated at 70° C (158° F), 5.0 asi			
D_1	350	40F	114
D_1	260	30F	271
D_1	270	25F	604
D_1	320	23F	498
D_1	280	22	25,000
D_1	270	21	20,000
Etched specimens, plated at 70° C (158° F), 8.6 asi			
D_2	125	50F	206
D_2	120	44F	325
D_2	120	38F	613
D_2	100	36F	248
D_2	100	34F	621
D_2	120	34	20,000
D_3	350	50F	121
D_3	310	44F	108
D_3	300	34F	611
D_3	370	33	27,000
D_3	350	31	21,000
D_3	370	31	20,000
D_4	920	40F	412
D_4	880	38F	950
D_4	800	36F	359
D_4	1000	36	24,000
D_4	880	35	20,000
Etched specimens, plated at 70° C (158° F) 13.0 asi			
D_5	430	65F	19
D_5	380	60F	139
D_5	340	54F	320
D_5	350	52F	293
D_5	380	50	19,500
Etched specimens, plated at 70° C (158° F), 8.6 asi, baked			
D_6	370	55F	141
D_6	330	50F	248
D_6	320	45F	429
D_6	320	42F	539
D_6	370	40	20,000
D_6	310	40	879
Unplated nitrided specimens (separate batch)			
E_0	None	102F	2,896
E_0	None	100F	1,388
E_0	None	98F	2,599
E_0	None	98	20,000
E_0	None	96F	2,378
E_0	None	94	20,000
Nitrided and etched specimens, plated at 70° C (158° F), 8.6 asi			
E_1	110	90F	71
E_1	110	80F	126
E_1	120	77F	137
E_1	120	75	20,000
E_1	130	74	20,000
E_2	430	80F	152
E_2	400	77F	81
E_2	370	76F	110
E_2	370	75F	129
E_2	400	75F	20,000
E_2	370	72	20,000
E_3	920	70F	84
E_3	910	65F	153
E_3	880	63	20,000
E_3	890	62	20,000
E_3	900	60	20,000
Unplated 60° V-notched specimens			
F_0	None	40F	93
F_0	None	32F	301
F_0	None	30F	740
F_0	None	29	25,500
F_0	None	28	23,300
F_0	None	28	20,000
F_0	None	13	40,000

TABLE IV continued

Designation	Chromium Thickness 0.00001 in.	Applied Stress 1000 psi	No. of 1000 cycles
Unplated nitrided 60° V-notched specimens			
G_0	None	70F	32
G_0	None	55F	339
G_0	None	48	588
G_0	None	45F	1,238
G_0	None	43	20,200
G_0	None	43	24,600

tested "as plated" or after baking at 205° C (400° F) for 16 hours, or had been nitrided before plating. With a plating temperature of 70° C (158° F), such a gradual decrease was found only for the nitrided specimens but not for the specimens with plate on untreated steel. The latter showed a sharp initial drop in fatigue limit with less than 0.0012 inch plate, but further increases in thickness had no clear-cut effect.

Nitriding of the steel raised its fatigue limit substantially (compare C_0 and E_0 with A'_0), but on subsequent chromium plating, the nitrided steel was found to be more affected by increasing plate thickness than the straight steel. Thus with more than 0.007 inch chromium deposited at 55° C (131° F) and, by very approximate extrapolation, with more than 0.024 inch chromium applied at 70° C (158° F), the untreated steel had higher fatigue limits than the nitrided steel.

Baking after plating at 205° C (400° F) for 16 hours caused a substantial decrease in the fatigue resistance of the untreated steel plated at 55° C (131° F) (compare the B-curve with the A-curve in Fig. 3), but had the opposite effect in the case of the 70° C (158° F) coating (compare D_5 with D_3 in Fig. 4).

For the same 55° C coating, Fig. 6 shows a pronounced drop in hardness and rise in number of cracks per field. Fig. 7 for the same 70° C coating, however, shows no drop in hardness, although there is a rise in the number of cracks.

Table V shows that 55° C, median current density chromium coatings after baking at

TABLE V

Effect of Baking Time on Fatigue Strength of Chromium Plated SAE 4340 Steel

Chromium Plated at 55° C (131° F), 2.1 asi.
Baked at 205° C (401° F).
F indicates ailure.

Baking Time, hr	Applied Stress 1000 psi	No. of 1000 cycles
None	55F	136
1	55F	98
2	55F	94
4	55F	88
8	55F	113
16	55F	103
None	53	20,000
1	53F	101
2	53F	106
4	53F	145
8	53F	83
16	53F	106

205° C for one hour exhibit no further substantial change in fatigue resistance up to 16 hours baking time. For the same coating, Fig. 6 shows substantial change in the plate hardness with heating time, but the number of cracks took a sharp rise at between 6 and 16 hours.

In Fig. 5 the two B-curves for baked 55° C coatings of two different thicknesses and the D-curve for unbaked 70° C coatings show an increase in fatigue limit with increasing plating current density. Within the experimental range, a comparison between the A-curve in Fig. 3 and the D-curve in Fig. 4, both for unbaked coatings on non-nitrided steel, show median current density chromium deposits to cause much less of a decrease in fatigue resistance when applied at 55° C than when plated at 70° C.

An examination of the hardness and crack curves for the same deposits in Figs. 6 and 7 gives the following results: The hardness values of the 55° C coatings unbaked (and baked at 205° C for 16 hours) are 750 (725) at 0.71 asi, 900 (750) at 2.1 asi and 925 (725) at 2.95 asi, and the number of cracks per field is 6 at 0.71 asi (note low thickness), 15 at 2.1 asi and 7 at 2.95 asi. The hardness

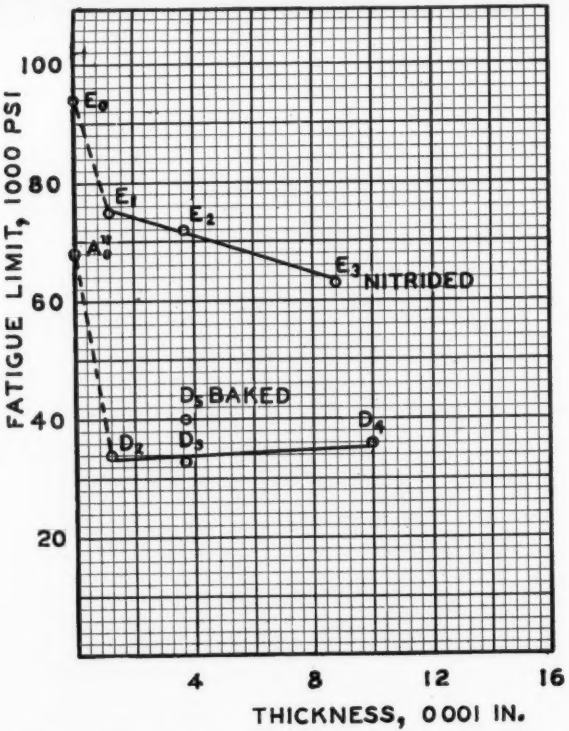

Fig. 4. Effect of plate thickness, nitriding before plating, and baking after plating on the fatigue strength of superfinished SAE 4340 steel, bright chromium plated a 70° C (158° F and median current density of 8.6 asit)

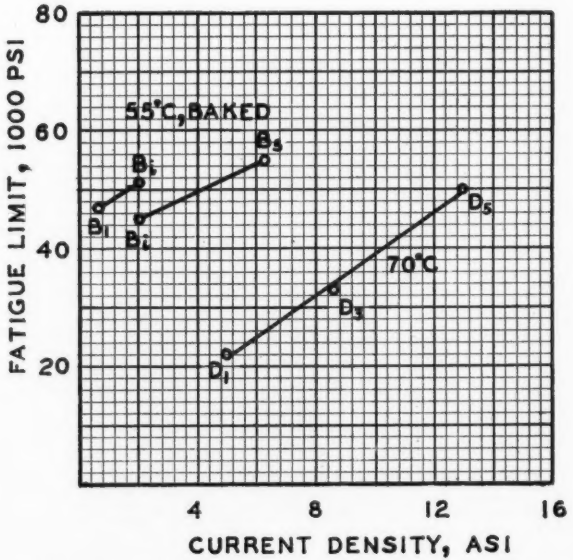

Fig. 5. Effect of current density during chromium plating at 55° and 70° C (131° and 158° F) on chromium plated superfinished SAE 4340 steel. Specimens from low emperature bath baked after plating Points B_i are interpolated from curve B in Fig. 3. Plate thicknesses for curves from left to right: 0.0020, 0.0033 and 0.0028-0 0038 inch

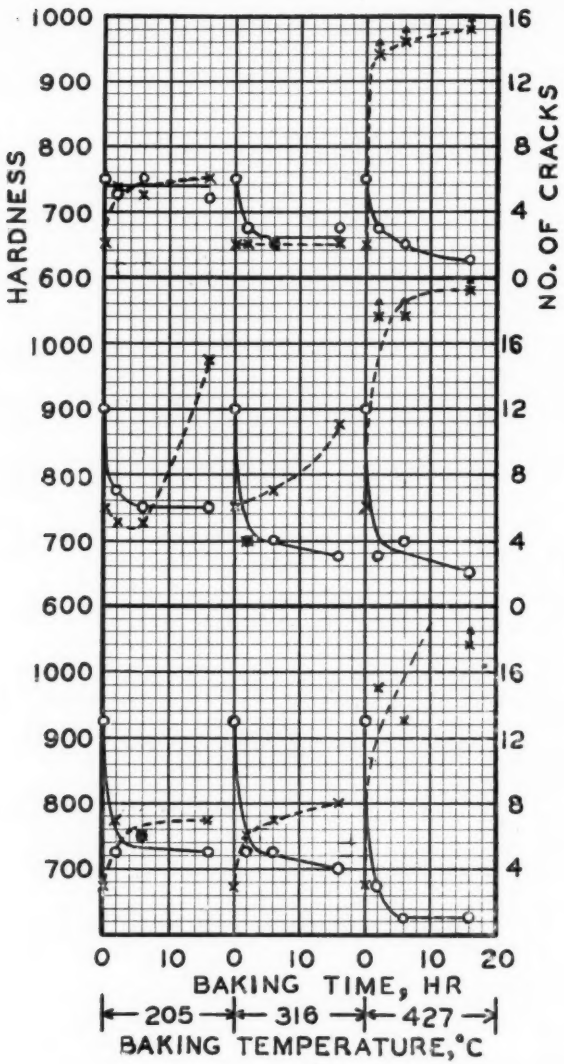

Fig. 6. Eberbach micro-hardness of and number of cracks per field in chromium coatings deposited at 55° C (131° F). From top to bottom: 0.0021-0.0026 inch coatings at 0.71 asi (low limit of bright range), 0.0036-0.0045 inch coatings at 2.1 asi (linear median of bright range), and 0.0032-0.0040 inch coatings at 2.95 asi (upper limit of bright range)

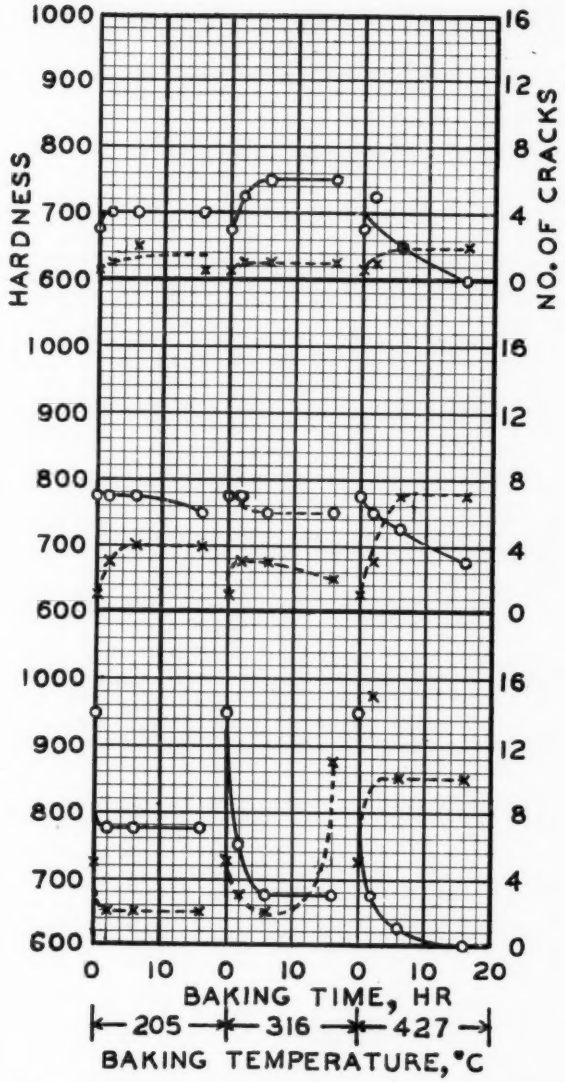

Fig. 7. Eberbach micro-hardness of and number of cracks per field in chromium deposited at 70° C (158° F). From top to bottom: 0.0015-0.0020 inch coatings at 5.0 asi (low limit of bright range), 0.0022-0.0032 inch coatings at 8.6 asi (linear median of bright range), and 0.0024-0.0034 inch coatings at 13.0 asi (upper limit of bright range)

TABLE VI

Effect of Plating Bath Temperature and Current Density as well as Baking Conditions after Plating on Crack Formation, Porosity and Hardness of Chromium Plate on SAE 1020 Steel

Eberbach Micro-Hardness Diamond Tester, 100 g load. Field observed with magnification 100X

Plating Bath		Baking		Hardness	Cracks per Field			Notes
Temp °C	Current Density asi	Temp °C	Time		Small	Medium	Large	
55	0.71	None	None	750	....	1–3	....	
55	0.71	205	2	725	5	1 (occ.)	....	Cracks unoriented
55	0.71	205	6	750	4	1	....	Porous
55	0.71	205	16	725	5	....	1	Porous
55	0.71	316	2	675	....	2 (edge)	....	More porous
55	0.71	316	6	650	1	....	1	Porous
55	0.71	316	16	675	1 (ctr)	1 (edge)	....	Porous
55	0.71	427	2	675	20–30	....	1 (edge)	Porous areas
55	0.71	427	6	650	30–40	....	Sev. (edge)	Porous
55	0.71	427	16	625	Many	....	Many	Very porous
55	2.1	None	None	900	6	....	....	
55	2.1	205	2	775	4	1	....	
55	2.1	205	6	750	4	....	1	
55	2.1	205	16	750	15	....	....	
55	2.1	316	2	700	....	4 (ctr)	....	Some cracks dendritic, sl. porous
55	2.1	316	6	700	6	....	1	Large crack branching, porous, checked edges
55	2.1	316	16	675	10	....	1	Porous
55	2.1	427	2	675	20–30	....	1	Large crack checked
55	2.1	427	6	700	....	20–30	....	Many cracks Y-shaped
55	2.1	427	16	650	Many	....	Many	Cracks checked
55	2.95	None	None	925	Sev.	....	....	Edge cracks checked
55	2.95	205	2	725	7	....	....	
55	2.95	205	6	750	6	....	....	Tendency to check
55	2.95	205	16	725	7	....	....	
55	2.95	316	2	725	....	6	....	
55	2.95	316	6	725	6	....	1	
55	2.95	316	16	700	7	1	....	
55	2.95	427	2	675	....	15	....	
55	2.95	427	6	625	10	3	....	
55	2.95	427	16	625	20–30	....	....	
70	5.0	None	None	675	....	1 (occ.)	....	
70	5.0	205	2	700	....	....	1	
70	5.0	205	6	700	1	....	1	
70	5.0	205	16	700	....	....	1 (occ.)	

TABLE VI continued

Plating Bath		Baking		Hardness	Cracks per Field			Notes
Temp °C	Current Density asi	Temp °C	Time hr		Small	Medium	Large	
70	5.0	316	2	725	....	....	1	
70	5.0	316	6	750	....	....	1–3	
70	5.0	316	16	750	....	....	1–3	
70	5.0	427	2	725	....	....	1	
70	5.0	427	6	650	....	....	1-3	
70	5.0	427	16	600	....	....	1-3	
70	8.6	None	None	775	....	1	....	
70	8.6	205	2	775	....	3	....	Some cracks checked
70	8.6	205	6	775	....	....	4	Some cracks checked
70	8.6	205	16	750	....	4	....	
70	8.6	316	2	775	....	3	....	
70	8.6	316	6	750	....	3	....	
70	8.6	316	16	750	....	....	2	
70	8.6	427	2	750	....	....	3	
70	8.6	427	6	725	5	....	2	
70	8.6	427	16	675	....	6–7	....	
70	13.0	None	None	950	....	5	....	
70	13.0	205	2	775	....	2	....	
70	13.0	205	6	775	....	2	....	
70	13.0	205	16	775	....	2	....	
70	13.0	316	2	750	....	3	....	
70	13.0	316	6	675	....	2	....	
70	13.0	316	16	675	10	....	1	
70	13.0	427	2	675	15	....	....	
70	13.0	427	6	625	10	....	....	
70	13.0	427	16	600	5	5	....	

of the unbaked 70° C coatings is 675 at 5.0 asi, 775 at 8.6 asi and 950 at 13 asi, and the crack numbers 1 at 5.0 asi, 1 at 8.6 asi and 5 at 13.0 asi.

One must conclude from the foregoing that a strict parallelism between fatigue resistance on the one hand and plate hardness and number of cracks on the other hand does not exist. There is a tendency for the hardness and the number of cracks to drop with dropping fatigue resistance, but this trend does not always hold and may even reverse itself in individual instances.

As a matter of fact, the parallel between hardness and number of cracks observed in the isolated cases set forth is not found to be general when Figs 6 and 7 are inspected, because with few exceptions the number of cracks is reduced when the hardness rises.

Reference

[1]Wiegard and Scheinost, "Fatigue Strength of Hard Chromium Plated Steel". *Z. Ver. deut. Ing.* **83**, 655–659 (1939).

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LABORATORY APPARATUS

for controlled current distribution on small, flat specimens

by J. B. MOHLER, *formerly Supervisor of Physical Chemical Laboratory, and* R. A. SCHAEFER, *Director of Research . . . The Cleveland Graphite Bronze Company, Cleveland, Ohio*

INTRODUCTION

The usual laboratory procedure for the investigation of plating baths consists in plating a panel suspended between two anodes; in this arrangement the current density varies quite widely over the area. In the preparation of panels for corrosion testing, the panels are selected or prepared to minimize this variation either by plating a relatively large assembly composed of a number of panels fastened edge to edge and using the middle portion for evaluation or by plating a large sheet and cutting the evaluation panels from the central portion. However, for preliminary experimental work in electrodeposition of alloys, it is very desirable to use a standard Pyrex beaker for the vessel with individual flat steel cathode approximately 4 x 6 x 1/16 inch.

Since it is essential to maintain a uniform current density over the entire area of the panel[1], an apparatus was developed by employing the principle of insulating boundaries. For theoretical considerations the cathode may be considered an infinite number of parallel circuits with the current distributing itself according to the inverse square of the distance between the electrodes. Insulating walls placed between the anode and the cathode can be conveniently substituted for apparent distance which equalizes the current density on all points of the cathode or can be used to obtain a uniformly varying current density. This case has been theoretically developed by Kasper[2] in the line-plane system of insulating boundaries extending indefinitely at right angles to the cathode with the anode being a line-electrode parallel to the plane walls. The well-known Haring cell[3] is an application of this principle employing the walls of a closed plating vessel to obtain uniform current density.

Another common cell which uses the insulated walls of the vessel as shadows is the Hull cell[4]. This cell is used to study the plating range where it is desirable to obtain a different current density at any line on the cathode parallel to the anode. It might be called a universal plating cell in that it will give valuable information on the plating bath at varying controlled current density. Occasionally, to overcome polarization of the anode in the Hull cell, it is desirable to take advantage of a large anode by suspending a modified Hull cell directly in the plating bath. The modifications which have been developed will be explained in another section of this article.

EXPERIMENTAL

Plating Cells for Uniform Current Density on Flat Specimen

A large number of exploratory cells were constructed to determine for a cathode of a given size the physical dimensions of the insulating walls required to obtain a uniform current distribution. Since current distribution represents metal distribution in the practical plating range, the thickness of

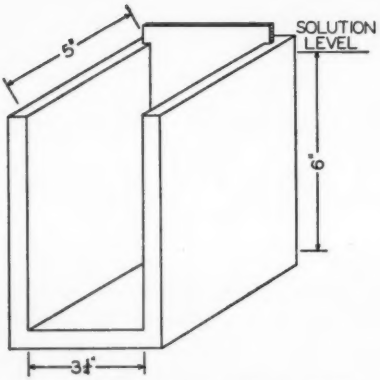

Fig. 1. Minimum insulating wall dimensions for uniform current density irrespective of anode position on a 4 x 4 x ⅛ inch flat SAE 1010 steel

metal deposited on the cathode was used as a measure of the uniformity of the current density. The cathode was a smooth, polished, clean chromium plated surface from which the plate could be readily stripped, measured, weighed, or analyzed.

A typical cell is shown in Fig. 1. The experimental work clearly indicated that a cell can be constructed which will give a uniform current density for a definite anode and cathode relationship. However, the ideal cell should have no limitations on the relative position of the electrodes. If the sides are extended indefinitely, mathematically speaking, one reaches a point where the relative position of the electrodes has little or no influence on the thickness of the deposit. Generally speaking, if the depth of the insulating walls is less than the width of the cathode, the anode must be directly in front of and centrally located with respect to the cathode, whereas, if the depth of the insulating walls exceeds the width of the specimen, the anode position is relatively unimportant.

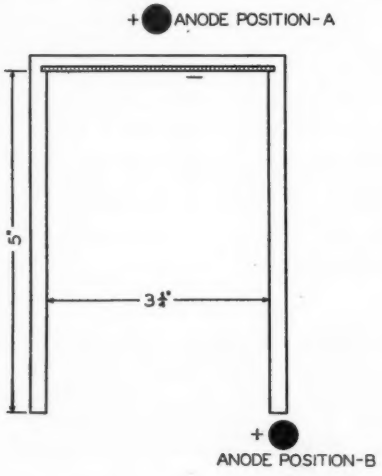

Fig. 2. Two extreme anode positions with respect to cathode for the cell in Fig. 1 (schematic)

TABLE I

Plate Distribution on Cathode with Anode Positions Shown in Fig. 2

Position on Specimen	Relative Thickness	
	Anode Position A	Anode Position B
1	1.00	.97
2	.98	.95
3	1.01	1.00
4	.99	.98
5	1.00	1.01
6	1.00	1.01
7	1.01	1.01
8	1.00	1.00
9	1.00	1.02
10	1.01	1.02
11	1.01	1.02
12	1.02	1.02
13	.98	.97
14	.98	.95
15	1.01	1.02

In Table I is listed the thickness data obtained with the anode in the unfavorable positions "A" and "B" illustrated in Fig. 2. The recorded thickness is a relative value with the thickness on the central section 8 arbitrarily assigned a value of 1.00. The probable accuracy of the method is ± 2 per cent for any individual section. In Fig. 3 are shown the exact positions of the specimens taken for thickness determinations with the numbers corresponding to those in Table I. The deposit consisted of lead[5] plated from a lead fluoborate bath for 40 minutes at an average current density of 20 asf.

Table I shows that if the length of the sides and bottom of the cell is at least 1½

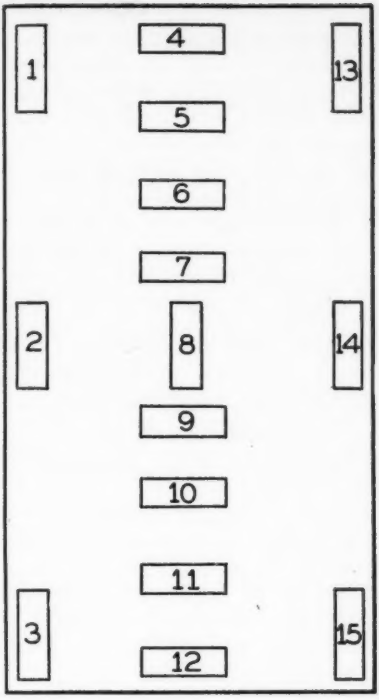

Fig. 3. Positions from which specimens were cut to determine data in Table I. The plated specimen was 6 x 4 x $\frac{1}{8}$ inch flat SAE 1010 steel, the insulating walls of the cell 6 x 3¼ x 5 inch deep

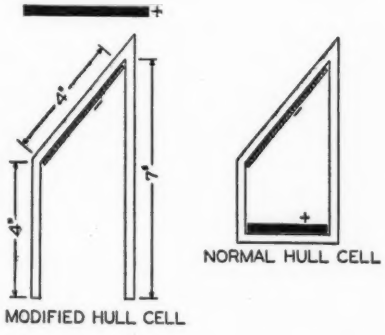

Fig. 4. Modified Hull cell with the insulated sides and bottom extended in comparison to the normal Hull cell

times the width of the cathode, the current is distributed uniformly within 3 per cent even if the anode is in a very unfavorable position.

Modified Hull Cell for Controlled Varying Current Density Studies

Experimental work has indicated that the Hull cell can be conveniently modified in either of two directions. The first modification is had by increasing the length of the insulating sides and bottom to a minimum of 1½ times the length of the cathode. This construction is schematically represented in Fig. 4.

The experimental work consisted in depositing lead[5] and silver[6] on the cathode of the modified Hull cell at an overall current density of 20 and 6 asf respectively for 40 minutes and 2 hours respectively. Strips were cut and weighed, and the local current densities were calculated and listed in Table II.

From the plotted data, the following formulae can be developed from the positions of the lines:

$$A_{Pb} = 2(12 - 19.5 \log L)$$

$$A_{Ag} = 0.6(10.3 - 11.9 \log L)$$

where A_{Pb} = current density in asf in lead deposition

A_{Ag} = current density in asf in silver deposition

L = distance from high current density in inches.

The second modification consists in an extension of the insulating walls in a direc-

TABLE II
Plate Distribution on Cathode of Modified Cell Shown in Fig. 4

Distance from High Current Density End Inch	Log Inch	Current Density asf	
		Lead	Silver
.3	−.52	45	9.8
.7	−.16	30	7.7
1.1	.04	24	6.2
1.5	.18	18	5.2
1.9	.28	14	4.1
2.3	.36	10	3.4
2.7	.43	6	2.8
3.1	.49	4	2.6
3.5	.54	3	2.4

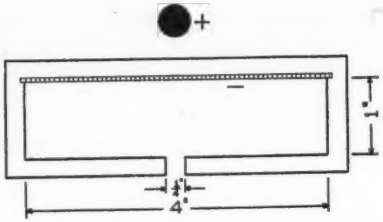

Fig. 5. Rectangular box type cell which produces uniform current density variation from either side of the center line

tion parallel to the cathode so that a box is obtained with one slot or a series of slots on the side of the rectangle opposite the cathode. In general, the single slot is most satisfactory, a typical cell being shown schematically in Fig. 5. The current density on the cathode varies regularly as the distance from the slot increases, regardless of the position of the slot. A cell with a centrally located slot, after calibration, may be conveniently used to determine the minimum current density at which plating can take place. For example, the CrO_3:H_2SO_4 ratio in a chromic acid bath could be determined from the width of the band of plate.

CONCLUSIONS

By reducing Kasper's theoretical data for the line-plane system of insulating planes to practice, convenient cells can be constructed which give either uniform or controlled varying current density.

The cells or racks may be constructed so that they are little affected by the size or the position of the anode. The independence of the anode is of value where the anode may cause polarization troubles or where it is desirable to have the anode an appreciable distance from the cathode. The cells have the advantage that they can be suspended directly in a plating bath.

Literature Cited

[1] Faust, C. L., *Trans. Electrochem. Soc.* **80**, 320 (1941).

[2] Kasper, C., *Ibid.* **77**, 353 (1940).

[3] Haring, H. E. and Blum, W., *Ibid.* **44**, 313 (1923).

[4] Hull, R. O., *Proc. Am. Electroplaters' Soc.* **27**, 52 (1939); *U. S.* **2**, 149, 344.

[5] Gray, A. G. and Blum, W., *Trans. Electrochem. Soc.* **80**, 645 (1941).

[6] Schaefer, R. A., *Monthly Rev. Am. Electroplaters' Soc.* **33**, 1176 (1946).

1948 CONVENTION NEWS

The Thirty-fifth Annual Convention of the A. E. S. will be held on June 28, 29, 30 and July 1, 1948, in Atlantic City, N. J., with the Newark Branch as the host.

The several committees are now working earnestly and untiringly to make this the largest and best convention ever. Plans for the *Industrial Finishing Exposition* have been laid, and satisfactory progress is being made in getting the cooperation of both supply houses and platers.

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WILLIAM F. BRUHNS,
Publicity Chairman,
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ELECTROLYTIC POLISHING OF CARBON-MANGANESE STEEL

A Critical Review of W. A. Spark's Article in J. Electrodepositors' Technical Society, 21, 245 (1946)

CHARLES L. FAUST
Battelle Memorial Institute, Columbus, Ohio

The author introduces his paper with a general discussion of the advantages and limitations of electropolishing. Particular reference is made to aluminum and stainless steel. The statement is made that a considerable amount of hand-polishing is required before electropolishing aluminum. For reflector quality, all hand-finishing or all electropolishing cannot match the quality of the combined hand-polishing and electropolishing. The opinion is expressed that electropolishing of stainless steel will supersede hand-finishing. Total reflectivity will be improved but specular reflectivity may not be so good.

Because of a lack of trained and skilled polishers accustomed to polishing carbon steels to close tolerances, electropolishing was investigated for finishing to close tolerances prior to chromium plating. Piston rods of hydraulic jacks and under-carriage shock absorbers required a high-class finish before chromium plating. The author investigated published compositions of electropolishing solutions and concluded that the sulfuric-phosphoric acid type was the most likely for large scale operations.* He studied different mixtures in the ranges of 90 per cent sulfuric to 10 per cent phosphoric and 10 per cent sulfuric to 90 per cent phosphoric acid. Percentages were by volume of acids, having the specific gravity of 1.80 and 1.75, respectively. Temperature was varied within the range of 20° C to 80° C (68° F to 176° F).

Specific reference is made to two baths: (1) 90 per cent phosphoric, 10 per cent sulfuric, 10 per cent water; and (2) 70 per cent phosphoric, 30 per cent sulfuric, 10 per cent water. (Parts by volume in both cases.) Tests were made at 1, 2, 4, and 6 asi and at 20, 40, 60, and 80° C. In bath (1) polishing was obtained only at 2, 4, and 6 asf at 60° and 80° C, and in bath (2), only at 4 and 6 asf at 60°, but at 1, 2, 4 and 6 asf at 80° F. In all tests, a standard area of steel tube was treated. Steel analysis showed: 0.27 per cent carbon and 1.53 per cent manganese. For the above conditions producing electropolishing, anodic efficiencies ranged from 41.7 per cent to 81.5 per cent. The minimum anode to cathode area ratio was found to be 1 to 2.5 and the maximum to be greater than 1 to 10. For electropolishing steel, the maximum permissible water content is placed in the region of 28 to 30 per cent and the minimum is about 9 per cent.

The effect of addition agents was investigated in sulfuric-phosphoric acid baths. It is postulated that effective addition agents must be capable of operating either to reduce the tendency for rapid dissolution of the anode or to strengthen the anode resistance layer. Dextrose, glycerine and chromic acid were studied.

Baths containing 45 to 50 per cent sulfuric acid and 55 to 50 per cent phosphoric acid (with water added to make 28 to 30 per cent by volume) and 3.5 per cent dextrose produced irregular polishes at 56° to 68° C and 6.5 to 11.0 volts. Current density was 2 to 5 asf. When the sulfuric-phosphoric acid mixture was changed from 30 per cent to 70 per cent, by volume, it produced better electropolishing. Work rod movement was necessary in order to avoid

*U. S. Patents 2,334,698 and 2,334,699.

severe grooving of the surface from gas discharge. Apparently the important function of the dextrose was to reduce the tendency to pit at higher current densities. Before electropolishing, the steel rods received the first grinding operation, and afterward they were rough- and finish-honed.

During use the dextrose carbonized and formed a black crust on the surface of the bath when it cooled. On reheating, the carbon was taken up and electropolishing conditions were again good. It is suggested that finely divided carbon black is the real addition agent when dextrose is used. Normal procedure was to hang the steel rods on the moving work bar at 7.8 to 8.5 volts without degreasing before electropolishing.

Pilot operation indicated that about 50 sq. ft. of surface could be electropolished per gallon of the bath containing dextrose. The electropolished surface offered more resistance to attack by industrial atmosphere than hand-polished surfaces.

When chromic acid addition was used in the sulfuric-phosphoric acid bath*, the electropolish finish was very high and mirror-like when conditions were carefully controlled. Reference is made to the falling-off of electropolishing ability with use of the bath†, as a result of the reduction of the chromate to chromic state of chromium.

The composition for the new solution is given as 47 per cent sulfuric acid, 43 per cent phosphoric acid, 5 per cent chromic acid being dissolved in the water before adding to the mixture. (Note: these are probably volume percentages and weight percentages intermixed; the basis is not clearly stated in the original article.) Operation at 47° C, 6.5 volts, and 1.8 to 3.5 asf produced a bright mirror finish.

Glycerine additions to the sulfuric-phosphoric acid type of bath did not lead to as high quality of finish as the dextrose and chromic acid additions. The latter also permitted a greater reduction in the required current density. For the current density ranges required for polishing, the voltage was 10 to 12 volts.

*U. S. Patent 2,338,321.

†C. L. Faust, Mo. Rev. Am. Electroplaters' Soc. **31**, 807 (1944).

From the study of addition agents, it is suggested that they modify the anolyte layer so that the minimum point of anode efficiency is maintained over a wider range of operating conditions. Effective throwing power is increased, and polishing is assisted in irregular sections where gas flow would otherwise have caused film removal and etching. Other additions were tried by the author with the ultimate objective of strengthening the anolyte layer and generally improving the performance of the sulfuric-phosphoric acid baths. Fixanol, Oleyol, Triethanolamine, Perminal W. A., Perminal Col., Gemex (a), Gemex (Z7), Teepol, and beta-naphthol were investigated at 0.05 per cent concentration (by weight) in a bath consisting of 60 per cent phosphoric acid, 30 per cent sulfuric acid, 10 per cent water (by volume).

From the author's discussion, it appears that only Teepol X showed promise for assisting in the production of a high degree of surface finish. Two "samples", A and B, showed positive results, whereas sample C did not under the conditions that were tested. For A and B, the conditions were respectively: 70° C, 7.2 volts and 65° C, 7.7 volts. Both were 10-minute treatments.

The very important matter of the "cleanliness" of the steel is discussed. There is a need for a specification for cleanness and reference is made to "Test for Cleanness in Steel" in the book by F. T. Hill, *Materials of Aircraft Construction*, 4th Ed., 1940, Pitman, London.

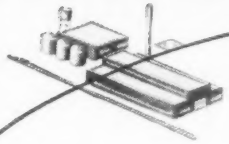
Author Sparks states, "Alloying constituents do not appear to offer much cause for concern, except in the case of high carbon steels which often contain considerable quantities of tungsten. Steels have been satisfactorily polished in the phosphoric-sulfuric solutions containing the following alloying constituents:

Nickel	up to a max. of 3.75%
Molybdenum	up to a max. of 0.5 %
Chromium	up to a max. of 1.4 %
Manganese	up to a max. of 1.75%
Vanadium	up to a max. of 0.3 %"

Very high alloy steels were not encountered in the work being discussed, which

(*Continued on page 1399*)

OUR PLANTS BLOOM THE YEAR 'ROUND



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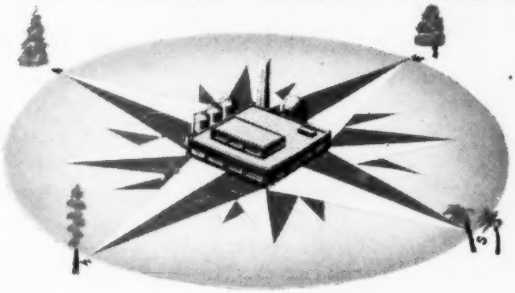

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THE RESEARCH ORGANIZATION OF THE AMERICAN ELECTROPLATERS' SOCIETY

RICHARD M. WICK

Bethlehem Steel Corporation, Bethlehem, Pa.

DR. WICK, WHO IS THE CHAIRMAN OF THE RESEARCH COMMITTEE OF THE AMERICAN ELECTROPLATERS' SOCIETY, PREPARED THIS PAPER AT THE REQUEST OF THE EXECUTIVE BOARD OF THE SOCIETY, FOR PRESENTATION AT THE RECENT INTERNATIONAL ELECTRODEPOSITION CONFERENCE HELD IN LONDON, ENGLAND, UNDER THE SPONSORSHIP OF THE ELECTRODEPOSITORS' TECHNICAL SOCIETY.

The rate of future development of the field of electrodeposition depends on the continuous growth of pertinent fundamental and technical knowledge. The American Electroplaters' Society has recognized the necessity for sustained research effort to safeguard the future of electrodeposition. The scope of industrial and institutional research is governed in many instances by local circumstances, and in consequence seldom achieves either breadth or depth. As a rule, such research is directed to the solution of a specific problem and results in a commercial process of economic value. These factors pertain to the question of the definition of the scope and aims of a Research Program to be sponsored by a Technical Society.

The research activities of the American Electroplaters' Society were interrupted during the war period and were resumed late in 1944. In renewing the Society's Research Program after this lapse, careful attention was paid to the nature of future research work, the placement of research projects, and the organization for research that would be most effective. An adequate program for guaranteeing financial support is a fundamental requirement for a sustained research effort.

The Research Committee

The American Electroplaters' Society, through its Executive Board, placed the responsibility for the organization and administration of the Society's Research Program in the hands of a Research Committee composed of nine appointed members, with the President of the Society and its Executive Secretary as members ex-officio. Each appointee serves for a term of three years, three new members being appointed annually. The committee members elect the Chairman of the Research Committee. Quarterly meetings of the Research Committee are held, at which questions of policy are developed. The Committee approves each new research project prior to its installation in the program. There are four principal sub-committees charged with the administration of the Research Program under the authority of the Research Committee. These sub-committees are for Policy, Publicity, Finance, and Research Direction.

Sub-Committee on Policy. The Chairman of the Research Committee with the Chairmen of the Committees on Publicity, Finance, and Research Direction, comprise the Policy Committee. This committee administratively interprets the policy of the Research Committee in regard to the problems at hand and recommends for the approval of the Research Committee any necessary policy changes.

Sub-Committee on Publicity. The dissemi-

nation of information concerning the Society's Research Program, other than the technical publications, is the responsibility of the Publicity Committee. Due to the size of the research activity, it became manifestly necessary that all matters of publicity be cleared through a central committee in order that a consistent policy might be maintained. The Publicity Committee receives material pertaining to the research projects in progress from the Chairman of the Research Directing Committee. This specific information on the research projects is correlated with other pertinent matter for presentation in a suitably comprehensive and organized form.

The Finance Sub-Committee. Working closely with the active Branches of the American Electroplaters' Society, the Sub-Committee on Finance is engaged continuously in maintaining and increasing the list of Sustaining Members that comprise the industrial support for the Research Program. Through their Branches, many of the individual members of the Society contribute directly to the Research Fund. Sustaining Membership is awarded to industrial concerns and others contributing more than a minimum amount annually toward the Research Program. The current number of Sustaining Members approaches 300 and is growing rapidly. It is this financial support of industry that makes the extensive program possible.

The Research Directing Sub-Committee. The administration of the Research Program is the responsibility of the Research Directing Sub-Committee. The Research Committee operates exclusively through its Research Directing Committee in regard to the individual projects. The responsibility of this committee for administration is complete. It starts with the installation of the project at the university or other research center selected. The organization of the program, the appointment of the project sub-committee, the general guidance of the project throughout, and finally the determination of the correct time to terminate a given research in view of its original objectives, are part of the duties of this Sub-Committee.

The Research Program

The resumption of research prior to the end of the war afforded the opportunity to initiate a modern program, both comprehensive and basic, for investigations designed to increase the fundamental and technical knowledge necessary for substantial future advances in the science and technology of electrodeposition. Topics selected as subjects for research are component parts of a broad program. Definite interrelation exists between groups of research projects according to deliberate plan recognized in the co-administration of the active program. As an example, the projects on the analysis of impurities, the effect of impurities and purification are coordinate, and both complement the projects on porosity and on physical properties of electrodeposits.

It is held by the Research Committee that its researches should not duplicate work in progress by others. It is a matter of policy that the researches should tend to expand knowledge on technical and fundamental matters rather than duplicate the objectives of industrial research laboratories in regard to the development of operating processes. The Research Program is designed for long range operation, and the firm policy to avoid researches on commercial processes is an important keystone in the permanent structure of the work. It is to be expected that increased progress in the development of commercial processes by the industry in general will be one result of the successful execution of our basic program.

In furtherance of the broad objective of these researches, every assistance and encouragement possible is rendered others interested in researches in the field of electrodeposition. The preexistence of research activity in a given university is not a prerequisite for active participation in this program. It is considered beneficial to the field of electrodeposition to stimulate the interest of professors competent in research, so that in some instances the Society's research project becomes the first project within the university in the field of electrodeposition.

Active Research Organization

After correct selection of research projects and adequate financing, the continuing success of the Research Program is determined by the calibre of organization, correlation, and supervision afforded by the Research Directing Committee. The Chairman of the Research Directing Committee is the central authority for administration. He is assisted by Vice-Chairmen each supervising a group of projects. Reporting through the Vice-Chairmen are Project Committees, each comprising three men selected from industry, who can confer with and advise the Project Director on all technical matters pertaining to his research. The Project Director is generally a professor of our own selection who is directly responsible for the research results. He is assisted by a graduate student, usually through a fellowship established at the university. Alternatively, the project may be at a research institution such as the National Bureau of Standards or an industrial research laboratory, depending upon the location of the Project Director.

It was an original conception of this program to combine the academic viewpoint of the university, through the professor selected, with the industrial viewpoint, by the appointment of the most competent men avilable from industry to form the three-man Project Committee. Experience during three years has more than justified this policy. The total force applied to each research comprises at least seven men: the Research Fellow, the Project Director, the three industrial specialists comprising the Project Committee, and the Vice-Chairman and the Chairman of the Research Directing Committee. Fine relationships have developed between the Project Directors and the industrial specialists, all focusing their attention on the same projects. Unsolicited testimony from both groups shows that the combination of talent is both beneficial and welcome.

In most research projects the initial step is the development of a bibliography followed by a correlated abstract and critical review of the published literature. In only a few cases has this appeared undesirable, and in those cases the determination has been to publish the state-of-the-art material at the end rather than at the beginning of the project. The permanent value of such critical literature reviews was never doubted, but the evident value of such work has become enhanced, for example, through the uncovering of more than 2,400 references on the subject of "Impurities and Purification of Electroplating Solutions". It is the purpose of this part of the work to secure as complete literature coverage as possible in order to facilitate all future researches along similar lines.

The specific experimental program is developed during the initial period devoted to the literature study. The most recent organizational modification is the institution of a temporary "Project Organizing Committee", the purpose of which is the development of the specific program prior to the active installation of the project.

Publication of the results of the Research Program is made usually in THE MONTHLY REVIEW* of the American Electroplaters' Society. Annually a report is made to the Society, at its Convention, on elements of each project. These reports appear in the *Proceedings* of the American Electroplaters' Society. Individual papers, or short series of papers, on a given project are bound in booklet form as Research Reports and made available at slight cost. A library of these Research Reports will one day constitute an important source of technical information in our field. This system of Research Reports is not unlike that employed by the International Tin Research and Development Council.

List of Researches

The first three of the list of active researches reflect the war conditions prevailing at the time the present research activity of the American Electroplaters' Society began. The projects on "Stripping of Copper", "Determination of Impurities", and "Adhesion" are recognizable as subjects that were of particular interest then. In the accompanying list there is given the serial number and the title of each research, the Project Director's name and affiliation, and the

*Beginning January, 1948 THE MONTHLY REVIEW will be called PLATING.

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Dr. C. Frederick Gurnham
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Project No. Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Project Accepted
1. "*Stripping of Copper from Various Base Metals*"	Indiana University	Prof. F. C. Mathers Mr. E. L. Martin (Assistant)	Mr. L. E. Weeg, Chairman, C. G. Conn, Ltd. Mr. L. C. Borchert, Houdaille-Hershey Corp. Dr. H. J. Wiesner, C. G. Conn, Ltd.	1944
2. "*Determination of Impurities in Electroplating Solutions*"	Lehigh University	Prof. E. J. Serfass Mr. W. S. Levine (Assistant) Mr. P. J. Prang, Jr. (Assistant)	Dr. D. G. Foulke, Chairman; Hanson-Van Winkle-Munning Co. Dr. W. R. Meyer, The Enthone Co. Dr. Henry B. Linford, Columbia University	1944
3. "*Methods for Testing Adhesion*"	University of Michigan	Prof. A. L. Ferguson Mr. M. R. Makepeace (Assistant) Mr. M. U. Tsao (Assistant)	Dr. R. B. Saltonstall, Chairman; Udylite Corp. Mr. F. C. Mesle, Oneida, Ltd. Mr. E. Hahn, Ainsworth Manufacturing Co.	1944
4. "*Effect of Surface Finishing of Non-Ferrous Base Metals on Protective Value of Plated Coatings*"	U. S. Time Corp., Middlebury, Conn.	Dr. George J. Kahan Mr. John W. Rigney (Assistant) Mr. J. O. Fairbanks (Assistant) Mr. Joyce Mulcrone, (Assistant)	Mr. M. B. Diggin, Chairman; Hanson-Van Winkle-Munning Co. Mr. E. A. Anderson, New Jerzey Zinc Co. Mr. A. W. Tracy, The American Brass Co.	1947

Project No. Title	Location	Project Director and Assistant	Project Directing Sub-Committee	Year Project Accepted
5. *"Effects of Impurities and Purification of Electroplating Solutions"*	Michigan State College	Prof. D. T. Ewing Mr. W. D. Gordon (Assistant)	Mr. B. C. Case, Chairman; Hanson-Van Winkle-Munning Co. Mr. L. B. Sperry, Doehler-Jarvis Co. Mr. R. C. Olsen, General Motors Corp.	1945
6. *"The Nature and Effect of Porosity in Electrodeposits"*	Princeton University	Dr. N. Thon Mr. E. T. Addison (Assistant)	Dr. W. A. Wesley, Chairman; International Nickel Co. Dr. B. Egeberg, International Silver Co. Mr. A. Mendizza, Bell Telephone Lab., Inc.	1946
7. *"Methods for Testing Thickness of Electrodeposits"*	Pennsylvania State College	Prof. H. J. Read Mr. J. H. Thompson (Assistant)	Mr. J. Mazia, Chairman; American Chemical Paint Co. Mr. G. Bowman, Standard Steel Spring Co. Mr. A. H. DuRose, Harshaw Chemical Co.	1946
8. *"Polarization at Electrodes in Electroplating Processes"*	University of Michigan	Prof. A. L. Ferguson Mr. R. S. Karpiuk (Assistant)	Dr. R. A. Schaefer, Chairman; Cleveland Graphite Bronze Co. Mr. E. Hahn, Ainsworth Manufacturing Co. Mr. G. Dubpernell, United Chromium, Inc.	1946
9. *"Physical Properties of Electrodeposited Metals"*	National Bureau of Standards	Dr. A. Brenner Mr. C. W. Jennings (Research Associate)	Dr. W. Blum, Chairman; National Bureau of Standards Mr. C. H. Sample, International Nickel Co. Mr. N. Promisel, Bureau of Aeronautics, Navy Department	1947
10. *"The Disposal of Plating Room Wastes"*	Yale University	Prof. B. F. Dodge Mr. D. C. Reams (Assistant)	Dr. C. F. Gurnham, Chairman; Whitney-Blake Co. Mr. M. L. Ross, E. I. du Pont de Nemours & Co. Mr. M. A. Orr, International Silver Co.	1947
11. *Current and Metal Distribution in Electroplating"*	Negotiating	.....	.....	.....
12. *"Cleaning and Preparation of Metals for Plating"*	Negotiating	.....	.....	.....
13. *"Internal Stress in Electrodeposits"*	Negotiating	.....	.....	.....

Year Project Accepted

1945

1946

1946

1946

1947

1947

REVIEW

date on which the project was accepted by the Research Committee as part of the program. This information is shown in the Table

The first project was instituted under the direction of Professor F. C. Mathers at Indiana University on "Stripping of Copper from Various Base Metals". This project, begun in 1944, is not now active. It had as its objective immediate practical results that were obtained and found to be useful.

"The Determination of Impurities in Electroplating Solutions" is the second project. It was placed originally under the direction of Professor G. Frederick Smith at the University of Illinois, with Professor Frederick Duke as the Research Fellow. Less than a year later, in 1945, the project was assigned to Professor E. J. Serfass at Lehigh University, where it is active today. Numerous individual papers on specific methods of analysis of impurities in nickel plating solutions have been published from this project These methods are available in bound form as Research Reports. The work is continuing on the study of impurities in copper plating solutions and will cover ultimately all commercial plating solutions.

The third project of the original group began in 1944 and was entitled: "Methods for Testing Adhesion". Professor A. L. Ferguson at the University of Michigan was appointed Project Director. The survey of the literature on "Adhesion of Electrodeposited Metals" is particularly complete. In addition, valuable information was brought to light through the publication of two papers covering the private file data that had been furnished to Professor Ferguson during the course of his investigation.

Project No. 4 is a continuation of previous work on ferrous metals by Dr. William Blum at the National Bureau of Standards. This project is entitled: "The Effect of Surface Finishing of Non-Ferrous Base Metals on the Protective Value of Plated Coatings". It has been placed at the Research Laboratory of the U. S. Time Corporation at Middlebury, Conn.; the Project Director is Dr. George J. Kahan. Among the least known of the several factors influencing the protective value of plated coatings is the quantitative effect of surface finishing, especially of non-ferrous metals. It is the objective of this project to determine whether surface finishing, particularly within commercial limits, can effect a significant influence on the protective value afforded by the plated coating.

The project on "Effects of Impurities and Purification of Electroplated Solutions" is the fifth project in the research program. It was begun in 1945 under the direction of Professor D. T. Ewing at the Michigan State College. Close cooperation exists between Project No. 2 on the analysis for impurities, and this project. The literature on this subject can be found to be so extensive as to render it substantially unavailable. The correlation of this literature, which is being done stepwise in reference to individual plating solutions as a matter of convenience, represents a valuable contribution. Experimental work now in progress is bringing to light new data of permanent value.

In 1946, a fundamental research on "The Nature and Effect of Porosity in Electrodeposits" was instituted at Princeton University. Dr. N. Thon is the Project Director, working in the laboratory of Professor Hugh S. Taylor, with whom he is associated. The critical literature review just published by Dr. Thon as part of this program is an outstanding contribution to this subject in which so little real progress has been made. Results of fundamental importance are a reasonable expectation from the continuance of this Research Project.

A matter of prime importance to all electrodepositors is the determination of the thickness of coatings. Accordingly, the seventh research project, entitled "Methods for Testing Thickness of Electrodeposits", was instituted in 1946 at the Pennsylvania State College. Professor Harold J. Read is the Project Director. The critical review of the plenteous literature is nearly completed. It is the objective of this research to develop comparative data on the precision and accuracy of the applicable methods for determining thickness of all commercial electrodeposits on the several base metals to which they are normally applied.

Professor A. L. Ferguson at the University of Michigan has undertaken his second

project for us as Project Director of our eighth research on "Polarization at Electrodes in Electroplating Processes". Circumstances beyond our control will require a temporary deferment of this project, but not before preparation of the literature survey and review can be completed.

Dr. William Blum at the National Bureau of Standards is a member of the Research Committee. Through his arrangement we are fortunate in having his associate Dr. Abner Brenner with us as Project Director for Project No. 9 on "Physical Properties of Electrodeposited Metals". This project is uniquely located at the National Bureau of Standards in Washington, D. C., where there are unsurpassed facilities for the specialized scientific techniques required in research of this character. This project, which began in 1947, is now well under way and is developing basic technical data that are much needed.

A chemical engineering problem that is increasingly important is the subject of our tenth project on "The Disposal of Plating Room Wastes". Professor B. F. Dodge, head of the Department of Chemical Engineering at Yale University, is Project Director. The problem of plating room waste disposal is not simple, including as it does chromic acids and cyanides as well as mineral acids and alkalies. A further complication is that methods eminently suitable for large installations are unsuitable for the small shop. Accordingly, it is an objective of this research to develop methods for small scale operations as well as for the larger users of electrodeposition.

Three remaining projects complete the current list at this writing: "Current and Metal Distribution in Electroplating", "Cleaning and Preparation of Metals for Plating", and "Internal Stress in Electrodeposits". Those three projects represent the immediate extension of the Research Program and are to be installed upon completion of their technical organization and the selection of the Project Director and university center.

Recognizing that the research organization described above and outlined in Table I is actively in progress, it is evident that a new opportunity has been afforded interested industry to cooperate both technically and financially in support of the program. This support has been realized in very practical terms. Not only has industry given generous financial support, but it has welcomed the opportunity for its technical staffs to participate actively in the program through work on the committees. The broad benefits of participation in this program are becoming still more apparent as the researches gather momentum.

Close interrelation and cooperation is maintained with coordinate societies. The American Society for Testing Materials is closely connected with our research work through the joint membership of several individuals on both groups. In extension of previous close relations, the A. S. T. M. is the issuing source for specifications that may develop from the American Electroplaters' Society Research Program. Similarly, the Electrochemical Society, the American Zinc Institute, the American Iron and Steel Institute, etc., have cooperated in one or another degree in connection with the program or its elements. The coordinate relation between the Research Program and the activities of other Societies is increasing steadily.

The purely technical and scientific basis of the Research Program has served to eliminate personal considerations to a marked degree, and has resulted in an exceptionally altruistic attitude on the part of each individual associated in this work. This desirable situation is made possible partly by the careful avoidance of conflict with industrial research interests. The criterion for all decisions in regard to the administration of these researches has been the best good for the field of electrodeposition. The satisfaction of accomplishment and interest in the work is the only compensation afforded the committee members.

The development and organization of the Society's present Research Program has been organic. Although it developed rapidly, it did not spring forth fully grown. Many problems were encountered in establishing the researches which, aside from the program subjects, included the selection of Project Directors, contractual relations with universities, selection of Project Committee

A. E. S. RESEARCH PROJECT No. 2 TO STUDY COPPER BATHS

The *Project Directing Committee* for *A.E.S. Research Project No. 2* has announced completion of the first phase of its work: the development of analytical methods for the trace impurities of lead, iron, manganese, copper, cadmium, chromium, silica, zinc, calcium, aluminum, sodium, potassium, and ammonia in nickel plating baths. Two general papers on the analytical procedures have been published[1,2], and specific procedures for the first four metals listed have also appeared[3,4,5,6] in THE MONTHLY REVIEW and in reprint form. The remaining papers are in the hands of the Committee for final review, and will be published in the near future.

The next work of this Project will be a similar study of copper plating baths, including both acid and cyanide types. The impurities tentatively selected for investigation are: chromic acid, lead, nickel, silver, tin, zinc, and chloride. In this connection, the advice of the members of the A. E. S. is earnestly requested: Are there other impurities for which analytical methods should be developed, or are some of those listed of no importance so that they should be dropped? This Project is, of course, handled in close cooperation with the committee on Project No. 5 on Effects of Impurities and Purification of Electroplating Solutions, but in addition correspondence would be appreciated from other members and friends with experience in this work. Following the investigations on copper, it is planned to study zinc, cadmium, and silver plating solutions.

The membership of the Project No. 2 Committee includes *Dr. D. Gardner Foulke*, Hanson-Van Winkle-Munning Company, Matawan, N. J., Chairman; *Dr. Walter Meyer*, Enthone, Inc., New Haven, Conn., and *Dr. Henry B. Linford*, Columbia University, New York. Please send suggestions on this work to any of these Committee members. The Project is being carried out at Lehigh University under the direction of *Professor Earl J. Serfass* of the Department of Chemistry.

C. FRED GURNHAM, *Vice-Chairman*,
Research Directing Committee.

References

[1] Foulke, D. G., Meyer, W. R., and Case, B. C. *Monthly Review* **33**, 836-842 (1946).

[2] Serfass, E. J. and Levine, W. S. *Ibid* **33**, 1073-1079 (1946).

[3] *Ibid.* **33**, 1079-1087 (1946).

[4] *Ibid.* **33**, 1189-1197 (1946).

[5] *Ibid.* **34**, 320-327 (1947).

[6] *Ibid.* **34**, 454-462 (1947).

References [1] to [6] have been reprinted in A. E. S. Research Report Serial No. 3, available from Society headquarters at 50 cents a copy.

Research Organization

(*Continued*)

personnel from the standpoint of capacity, interests and geographical location, and the initiation of the desired *modus operandi*. The interrelationship between projects, fostered by exchange of current information, and the development of private file data from industrial concerns and private sources, made possible by the Society's sponsorship, are all aspects of the program in motion. Continuation of this research for a period of ten years, augmented by the work of other interested groups, gives promise of a decade of fundamental progress heretofore unequaled.

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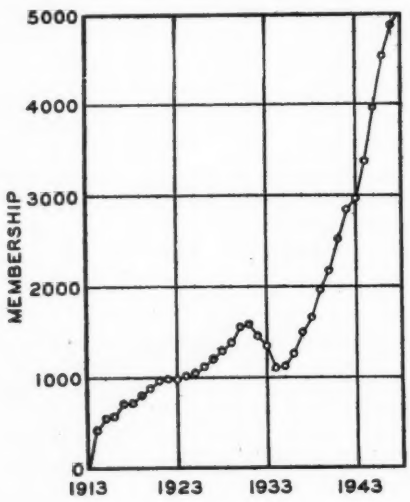
Thanks go to Mr. Elliot W. Horning of Cincinnati, Ohio, who kindly contributed back issues of THE MONTHLY REVIEW and *Proceedings* for distribution to libraries in Branch cities.

A. E. S. ACTIVE MEMBERSHIP PASSES 5000

It is with considerable pride that we announce that the Society's active membership has passed the 5,000 mark. Credit goes not only to A. E. S. Membership Chairman, Second Vice-President Arthur W. Logozzo, and all the membership committees of the Branches but also to their many predecessors who have so freely devoted their best efforts to the success of the Society.

Our thoughts go back to that small devoted group who launched the Society at a meeting in New York City in 1912 and to those who, in 1909, formed the predecessor society, the National Electro-Platers Association of the United States and Canada. Charles H. Proctor, George B. Hogaboom, J. H. Hansjosten, Arthur B. Wells, Horace H. Smith, Walter Fraine, William H. Barrows, and F. J. Liscomb are some of the names that stand out and always will be remembered.

These men and their fellows showed much foresight: They made the A. E. S. an educational society instead of a foreman's union which many desired. They also based the Society on local Branches, a move which assured a broad popular support. The wisdom of their actions is shown by the Society's growth illustrated in the accompanying graph. Except for the depression years 1922–1923 and 1932–1934, the expansion has been steady and at an ever-increasing rate.



Much has happened during these years. The first issue of the *Quarterly Review* of the National Electro-Platers' Association indicates that the members' interests were centered on decoration; it contains articles on antique finishes, various gold finishes, and lacquering, with one article on "The Electrical Side of Electroplating". The first issue of the *Quarterly Review* of the American Electroplaters' Society indicates a somewhat broader scope with three articles on copper and brass plating, one on cleaning stove parts, one on acid zinc plating, and several general articles. The Watts nickel bath, cyanide cadmium and zinc plating baths, and the chromium plating bath were to come later, not to mention modern pyrophosphate, fluoborate, and alkanesulfonate baths. The Society has grown with the development of the art and the industry.

Now our eyes should turn from the past to the future, to the 6,000 mark to start with, and then to the 10,000 mark. The membership has doubled in the last five years. If every member today is as conscientious about his membership as those of five years ago, the 10,000 mark should be reached in 1952. With the greatly increased values that the A. E. S. has to offer prospective members today, the goal should not be difficult to reach much earlier. Why not in 1948?

GUSTAF SODERBERG, *Editor.*

APOLOGY

Through an oversight in proofreading page proofs, the name of the senior author of the article on "Continuous Electrolytic Solution Purification" was spelled Heusser. All of our readers must have recognized that it should have been Heussner. Our sincere apologies.

STANDARDIZATION OF pH SCALE

The *p*H unit, used to express numerically the degree of acidity or alkalinity of aqueous solutions, may be defined in a number of ways, each resulting in a slightly different value for the *p*H of a given solution. Consequently, several *p*H scales, based upon various definitions, have met with equal favor among chemists. In view of the increasing need in science and industry for accurate determinations of acidity, the *National Bureau of Standards* is recommending the universal adoption of a single standard *p*H scale, analogous to the International Temperature Scale. It is proposed that the *p*H assigned to solutions of buffer substances distributed by the Bureau as *Standard Samples* be taken as the fixed points on this standard scale.

The several convenient *p*H meters now available commercially enable precise determinations of *p*H values in such media as electroplating solutions to be made with ease and rapidity, but these values are based upon a scale fixed by the *p*H assigned to the standards with which the instrument has been calibrated. The differences among scales of *p*H are the direct result of different procedures, definitions, and assumptions employed in arriving at the *p*H of the standard. The *p*H may be defined in one instance as the negative logarithm of the hydrogen-ion concentration or, again, of the effective concentration or "activity" of this ion. Often the *p*H value as defined by Sorenson in terms of the electromotive force of a galvanic cell with hydrogen and calomel electrodes is chosen. Although the differences among these scales rarely exceed 0.1 unit, the need for greater accuracy makes desirable the general adoption of a single series of consistent *p*H standards.

In an effort to encourage standard procedure in *p*H measurements, the National Bureau of Standards is now supplying four buffer materials in the form of *Standard Samples* of certified purity. These substances are acid potassium phthalate, potassium dihydrogen phosphate and disodium hydrogen phosphate (intended to be used together), and borax. They are being distributed at the rate of several hundred samples annually. The certificates furnished with these compounds specify the *p*H of certain aqueous solutions of the sample, which can provide fixed points on a *p*H scale.

In order to assign exact values to these fixed points, it was necessary to set up a scale based upon some suitable definition of *p*H. A consideration of the advantages and limitations of several scales led to a choice of a modified activity scale as most convenient and practical for general use. Although the activity of a single ionic species can be simply defined only in very dilute solutions, the influence of the hydrogen-ion activity in chemical equilibria is of far-reaching importance.

The *p*H of the NBS standards is derived from measurement of the electromotive force of cells without liquid junction, in which they are used as electrolytes. These cells are specially designed, utilizing the highly reproducible hydrogen and silver-silver chloride electrodes. Computation of *p*H is based upon several reasonable assumed relationships between ionic activities and mean activities. These assumptions are found to give identical values for dilute solutions The scale thus obtained approaches a true scale of activity for solutions of low concentration; at higher ionic strengths it is best regarded as a consistent scale which necessarily rests upon an assumption not subject to experimental proof.

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BOOK REVIEWS

By DR. HAROLD J. READ
Associate Professor of Metallurgy—The Pennsylvania State College

CERAMIC WHITEWARES by Rexford Newcomb, Jr., 1947, xii + 313 pages. Pitman Publishing Corporation, 2 West 45th Street, New York, N. Y. Price, $5.00.

There has long been need for a clearly written, authoritative aad modern text dealing with the engineering properties and uses of the various types of pottery, porcelain, or china which are known as ceramic whitewares no matter what their end use, or incidentally, their color. The book by Mr. Newcomb meets these desiderata to a very satisfactory degree. His academic, industrial, wartime and publishing experiences have provided him with a comprehensive fund of information which has been skillfully organized and presented in the text.

The present reviewer is not qualified to assess the technical accuracy of the minutiae, but he has been assured by colleagues who are specialists in the field (one of whom is using the book as a classroom text) that aside from a few trivial errors, the volume is very satisfactory from this viewpoint. In any case, it is far superior to anything else which is available in this field.

The subject matter of the book is logically arranged, being headed by a concise but fascinating introduction written by Carlton Atherton. One would like to see this chapter expanded to a full book. The second chapter is a comparatively short discussion of silicate science, the comprehension of which may be rather difficult for those readers who are unfamiliar with equilibrium diagrams and phase rule studies.

The next fout chapters deal with the raw materials for ceramic bodies, the preparation of these materials, the forming and drying of the ware, and finally the firing. The treatment of these topics is particularly satisfying in that there is adequate detail without verbosity.

A section on properties and tests describes briefly but sufficiently all of the commonly accepted test methods used in determining the properties of fired ceramic wares, particularly as they are conducted under specifications set up by the A. S. T. M. and the A. S. A. Representative values of these properties are given.

The final step in the production of ceramic materials encompasses the glazing and decorating operations. This complicated subject is treated in 30 pages, but it is surprising to note how much information has been packed into the chapter.

The remainder of the book, approximately 100 pages, is devoted largely to the methods of utilizing ceramic whitewares. Their use in construction work and in the home is described in discussions of tile, sanitaryware, table service, kitchenware, containers and artware. Whiteware products find extensive use in the electrical industry, and are classified in a chapter on this application according to their properties as insulators. A section on the miscellaneous industrial uses of whitewares is organized on the basis of the resistance of the various types of bodies to abrasion, heat, or chemical attack. The latter subject should be of particular interest to the electroplater. The final chapter deals with the sources, properties, manufacture and uses of abrasives. It is too brief to be of more than passing interest to the metal finisher.

The book is plenteously illustrated with a well-chosen selection of photographs and line drawings of excellent quality.

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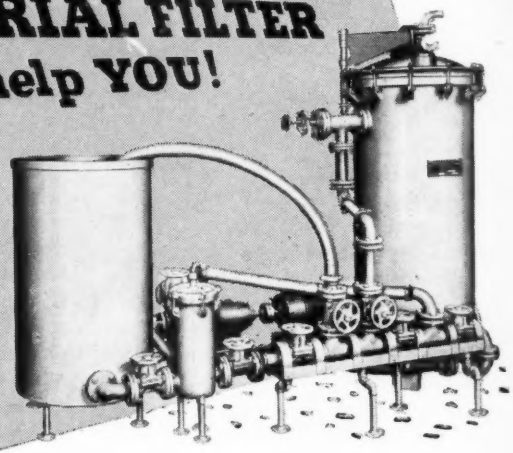

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Phenomena of Adsoprtion and Desorption Taking Place on the Surface of Iron After Acid Electrolytic Surface Treatment

PAUL BASTIEN, SIMON MISCHNONSNIKY, and CHANTAL DE SENNEVILLE. *Comptes Rendus* **224**, 126–127 (January 13, 1947).

Pickling of iron, by cathodic means or using an acid bath, causes an increase in the hydrogen content of the metal and the elimination of surface oxides. Such a surface possesses high resistance to the adsorption of air. Investigations were performed to prove this assumption and to establish the relation between the adsorption and desorbtion of air and hydrogen.

A New Process for Electropolishing Silver

DANIEL GRAY and S. E. EATON. *Iron Age* **159**, 64–65 (April 10, 1947).

Process described employs a current in a direction opposite from that employed in normal plating, is performed in an alkaline cyanide bath without removing the parts from the original plating racks, and results in a complete polish up to mirror brightness.

Finishing Copper by Oxidation with Sodium Chlorite

WALTER R. MEYER and G. P. VINCENT. *Metal Finishing* **45**, 61–63, 71 (March 1947).

Oxide finishing of copper and its alloys by use of sodium chlorite and alkali is described. An immersion process, it not only prevents further oxidation of the surface but acts as an excellent base for organic coatings due to the toothing of the surface caused by the oxidizing reactions. Pretreatment preparation of the metal is given, and control conditions of the bath explained.

The Chemical Surface Treatment of Magnesium Alloy Sheet for Spot Welding

W. F. HESS, T. B. CAMERON and D. J. ASHCRAFT. *Welding* **26**, 170s–190s (March 1947).

Before spot welding, the protective oil or chrome-pickle coating must be removed. Previously this had to be done mechanically. Various solutions were investigated in an attempt to develop a satisfactory chemical procedure. Cleanliness of the sheet was evaluated by measuring sheet-to-sheet electrical resistance. A satisfactory solution for sheet obtained from two manufacturers consisted of 10 per cent CrO_3 containing 0.05 per cent Na_2SO_4. Many tables and charts give details of results. 12 ref.

Electro-Tinplate

I. The Influence of Plating Conditions on the Quality of Electro-Tinplate Deposited from the Stannous Sulfate Bath

R. M. ANGLES, K. W. CAULFIELD, and R. KERR. *J. Soc. Chem. Ind., Trans. Comm.* **65**, 430–433 (1946).

The quality of tinplate formed under different plating conditions from the stannous sulfate-cresolsulfonic acid bath was compared by the thiocyanate and hot-water porosity test and by exposure in a humidity chamber. Within the ranges examined, the

quality improves with increase of tin concentration of the electrolyte and with decrease of current density. Optimum concentration of acid depends on tin content. Raising the temperature impairs the quality of the deposits. No significant improvement was obtained by addition of commercial wetting agents.

Electro-Tinplate
II. The Influence of Coating Thickness on the Porosity and Resistance to Corrosion of Electro-Tinplate
III. The Influence of Pickling Conditions on the Porosity and Corrosion Resistance of Electro-Tinplate

K. W. CAULFIELD, R. KERR, and R. M. ANGLES. *J. Soc. Chem. Ind., Trans. Comm.* **66**, 5–11 (January 1947).

In Part II, study was made of effect of variation in coating thickness on quality of electro-tinplate deposited from stannous sulfate and sodium stannate baths. Curves show influence of coating thickness on thiocyanate, hot-water porosity, humidity, and salt-spray test values, and effect of time of exposure out-of-doors on weight increment for a range of coating thicknesses. In Part III, quality of coatings from alkaline and acid baths was determined following different pickling treatments. Inhibited sulfuric acid was found to be best for alkaline-bath deposits, anodic etching in sulfuric acid best for the acid-bath type. Details are tabulated.

Metallography for the Electroplater

ALEX BLAZY and J. B. MOHLER. *Metal Finishing* **45**, 54–57 (April 1947).

Techniques in metallography for the examination of electroplated coatings are described. Equipment necessary for this type of work is investigated in some detail, and an explanation of microscopic methods of interpreting electrodeposited coatings is given. Tables list necessary etching reagents for common metals and alloys and give directions for their use.

Surface Area of Chrome Plated Nickel

CALLAWAY BROWN and HERBERT H. UHLIG. *J. Am. Chem. Soc.* **69**, 462–465 (1947).

Low-temperature absorption of inert gas was the technique used to measure true "accessible" area of chrome plated surface, as opposed to apparent area. Technique and results are described. Results show 10 to 50 times as much "accessible" area as apparent area.

Tin as a Coating Material in the Wire Industry

BRUCE W. GONSER. *Wire and Wire Products* **22**, 207–210, 242–243 (March 1947).

Discusses hot tinning, electrolytic tinning, replacement from aqueous solutions, replacement in molten salt, and some unusual applications of tin coatings. 15 ref.

The Electrolytic Polishing of Carbon-Manganese Steels

W. A. SPARKS. *J. Electrodepositors' Tech. Soc.* **21**, 245–264 (1946). (Reprint.)

Gives a full description of a series of experiments carried out to develop a process capable of being operated on a commercial scale with a minimum of technical control over the variables. Effects of various addition agents and the choice of steels are described.

Metal Coating of Plastics by Vacuum Evaporation Techniques

F. C. BENNER. *Electrical Manufacturing* **39**, 107–109 (March 1947).

The metallizing of plastics parts in electrical products is discussed in this article.

Electrostatic Spraying of Steel Wall Panels

W. S. REED. *Materials and Methods* **25**, 77–79 (February 1947).

Describes equipment and procedures in the application of finish coats through the use of ele trostatic spraying and infrared drying.

The Color Anodizing of Aluminum

G. T. COLEGATE. *Metal Treatment* **13**, 248–264 (Winter 1946–1947).

Describes the various anodizing methods available, the dyes and other pigments used, and the practical control of the processes.

Ammonia in Brass Plating Solution

S. BUCHAN and W. D. RAE. *IRI Transactions* **22**, 221–226 (December 1946).

A common method for bonding rubber to metal is by means of an intermediate layer of electrodeposited brass. One of the most important factors controlling the type of deposit, which in turn influences the quality of the rubber-metal adhesion, is the ammonia content of the plating solution. The mechanism of the action of the ammonia was investigated by a unique method, which is described. Results are tabulated, charted, and evaluated. It was found that while ammonia reduces the efficiency of deposition, it also increases the throwing power of the solution and produces a more uniform deposit.

Mirror Bright Copper Plating

JOHN ANTHONY. *Iron Age* **159**, 54–55 (February 13, 1947).

Describes a brightener solution which when added to the conventional copper cyanide plating bath offers promise of lower plating costs by eliminating the need for buffing copper deposits and serves to cut down the racking and handling time in the plating shop.

Fusing of Electrodeposited Tin Coatings

J. FALK. *Metal Finishing* **45**, 63–65, 71 (April 1947).

Sinplified method of obtaining extremely lustrous electroplated tin finishes by fusing of thin coatings is explained in detail. Equipment necessary to perform this operation is listed and control conditions given. Fused electroplated tin coatings give not only brilliance but, theoretically, have higher corrosion resistance because of less porosity than non-fused coatings.

Tin Plating and Control of Tin Solution by Anode Color

JOHN FRANKLIN DAYMUDE. *Products Finishing* **11**, 42–44, 46, 48, 50, 52, 54, 56 (March 1947).

Presents instructions for the operation of a low-caustic, low-temperature tin-plating solution. Plating solution under consideration is applicable to a wide variety of base metals and possesses excellent throwing power.

Magnetic Particle Inspection of Chromium Plated Tools

H. M. MUELLER and W. E. YEAST *Metal Progress* **51**, 420–425 (March 1947).

Tells how change in the equipment and technique of magnetic inspection together with draws at 350° F to relieve internal stresses brought rejects from around 50 per cent to 0.5 per cent in an epidemic of broken tools used in the manufacture of small-arms ammunition.

Abrasive Finishing of Plastics

ANON. *Materials and Methods* **25**, 119 (March 1947).

Tabular summary of a series of case studies involving the abrasive finishing of plastic parts.

The Cronak and Similar Processes

P. C. SMETHURST. *Process Engravers' Monthly* **54**, 58, 61 (March 1947).

In the Cronak process for treatment of photolitho zinc sheets before use in order to avoid scumming during printing, the sheets are placed in an ammonium dichromate-sulfuric acid bath for 30 seconds. The chemical mechanism of this and similar processes is discussed, and a recent letter by L. P. Clerc relative to the possible invalidity of the Cronak patent is commented upon.

Electroforming (Concluded)

E. A. OLLARD. *Metal Industry* **70**, 126–128 (February 14, 1917).

Methods employed for producing electroformed articles are illustrated by several typical examples.

Bright Chromium Plating and Temperature Control

M. G. HERBACH and C. W. BOWDEN, JR. *Metal Progress* **51**, 257–259 (February 1947).

Discusses types of chromium plate, preparation for plating, control of cleaning baths, chromium plating process, control of chromium plating, details of control system, installation.

Quick Guide to Solutions for Stripping Metal Overlays

J. B. MOHLER. *Iron Age* **159**, 66–67 (May 8, 1947).

A quick guide to the selection of the solution most suitable for stripping a given plate from a specific base metal is given. Solutions listed are arranged in order of preference. Makeup of the solutions listed is given in table. Tables present recommended methods, but may also be used to select stripping solutions for experimentation where no recommendations are given.

Selenium Rectifiers

JULIAN LOBENSTEIN. *Machine Design* **19**, 112–114 (March 1947).

Increased-size plates capable of sustaining much higher voltage make them more useful as dry-plate rectifiers for miscellaneous applications which are described. General characteristics of various types of rectifying equipment are tabulated.

Plating and Anodizing Aluminum

ANON. *Light Metals* **10**, 17–19 (January 1947).

Deals with bath compositions for electrodeposition on aluminum and with limitations of the anodic process as a method for finishing domestic ware.

Electroplating and Cathodic Pickling as Causes of Hydrogen Embrittlement

CARL A. ZAPFFE and M. ELEANOR HASLEM. *Wire and Wire Products* **22**, 351–356, 379–381 (May 1947).

Describes a new bend test said to be especially suitable for measuring brittleness of wire specimens. Demonstrates the effects of pickling time, bath temperature, and bath impurities on hydrogen embrittlement during cathodic pickling. Shows that hydrogen absorption is identical for acid or for alkaline electrolytes. Gives a quantitative evlauation of embrittlement caused by chromium plating and by cadmium plating, both of which are shown to cause embrittlement equaling or exceeding that caused by cathodic pickling.

Tests for Adhesion and Hardness of Surface Coatings

H. GRINSFELDER. *Organic Finishing* **8**, 38–42 (April 1947).

Presents study of the accuracy and reproducibility of five widely used tests for adhesion and hardness of surface coatings made in the laboratories of The Resinous Products and Chemical Company of Philadelphia. Tests studied were the Sward Hardness Rocker, the Pencil Method, the Modified Bell Laboratory Mar Adhesion Test, and the Finger Nail and Knife Scratching Tests.

High-Solids Metal Lacquers

J. K. SPEICHER. *Canadian Chemistry and Process Industries* **31**, 214–217 (March 1947).

Discusses various methods used to increase the solids content of lacquers, thus reducing the amount of solvent required. Data are presented concerning resins which in combination with nitrocellulose give low viscosity solutions and which can be used in high proportions relative to nitrocellulose and still give durable lacquers. Includes results of two-year outdoor-exposure tests.

A New Anti-Cementation Coating

L. M. KAMIONSKY. *Engineers' Digest* (American Edition) **4**, 157 (April 1947). Condensed from *Vestnik Mashinostroenia* Nos. 2 and 3, 71–72 (1946).

Describes a protective mixture which deposits a layer of copper on metal parts for which electroplating is not convenient or practicable.

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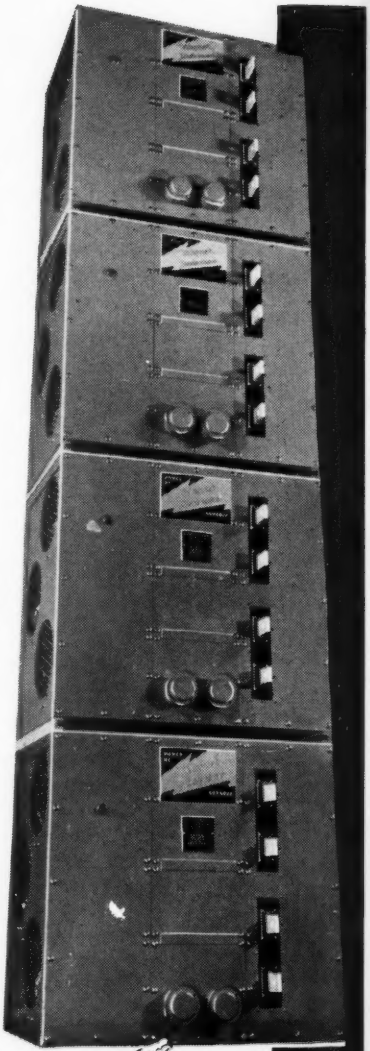

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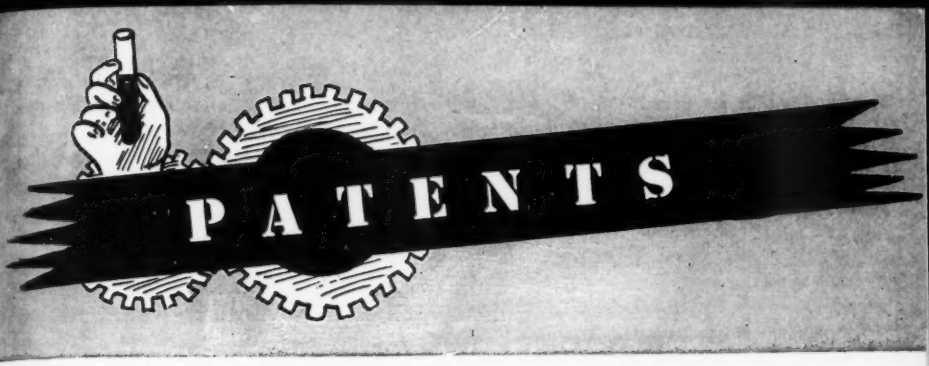

By GEORGE B. HOGABOOM

Consultant, New Britain, Conn.

No. 2,428,404, October 7, 1947—Electrodeposition of Molybdenum-Cobalt Alloys—L. F. Yntema, assignor to St. Louis University, St. Louis, Mo.

The following is an example of a suitable electrolyte for codeposition of an alloy of molybdenum and cobalt in accordance with my invention:

	Range	Optimum
Water, liters	1	1
Sodium molybdate, grams	10–30	20
Cobalt sulfate, grams	5–15	10
Sodium hydroxide, grams	100–300	250
Sodium carbonate, grams	40–120	80
Dextrose, grams	10–30	20
Temperature	Room	
Current density, amp/dm^2	0.03–0.5	

CLAIM 2. The process for electrocodepositing an alloy of molybdenum and cobalt which consists in passing a current between an anode and the work to be plated as a cathode in an aqueous electrolyte consisting essentially of 10 to 30 grams per liter of hexavalent molybdate compound, 5 to 15 grams per liter of a soluble cobalt compound, 100 to 300 grams per liter of free alkali metal hydroxide, and 10 to 30 grams per liter of an organic compound having a hydroxyl group of the class consisting of sugars, glycerine, glycols and tartaric acid.

NOTE: The molybdenum-cobalt plates are very bright, very hard and adherent, and are resistant to tarnishing and to the action of a 3 per cent sodium chloride solution.

5 Claims.

No. 2,429,902, October 28, 1947—Apparatus for Producing Electroplated Sheets—M. M. Sternfels, assignor to Chromium Corporation.

CLAIM. An apparatus for producing electrolytic metal foil which comprises a tank containing a metal plating bath, a metal drum having a cylindrical, electrolytically conducting surface with insulated ends substantially flush with said conducting surface mounted so that a portion of its surface dips into said baths, means for rotating said drum, at least two endless insulating masking tapes spaced parallel and mounted in such a fashion as to wind unto and unwind from said drum while engaging the immersed surface of said drum and covering the joints between the insulated ends and the conducting surface of the drum, thereby forming two insulated bands of drum surface separated by a conducting band, an anode, means for passing an electric plating current through said anode to said conducting band serving as cathode, whereby a deposit of electrolytic metal forms on said conducting band, means for continuously stripping said electrolytic deposit from said drum, means for separating said masking tapes from the drum surface, a tank containing

cleaning liquid, means for passing said tapes into and out of said cleaning liquid while they are unwound from said drum, and means for conveying the cleaned tapes back to be rewound on said drum.

1 Claim.

No. 2,429,970, October 28, 1947—Silver Plating—C. J. Wernlund and J. R. Macon, assignors to E. I. du Pont de Nemours & Company.

CLAIM 1. A process for producing bright silver electrodeposits which comprises electrolyzing a silver-alkali metal cyanide solution containing an organic sulfur compound selected from the group consisting of 2-mercaptobenzothiazole, 2-mercaptothiazole, 2-mercaptothiazoline, thioacetanilide, and trimercaptocyanuric acid in an amount sufficient to brighten the deposit within the range of 0.001 to 1 oz per gallon.

EXAMPLE 1. Silver was plated from the following solution maintained at a temperature of 27° C to which was added 2-mercaptobenzothiazole.

Silver cyanide	10 oz/gallon
Potassium cyanide	17 oz/gallon
Potassium hydroxide	0.25 oz/gallon

Bright deposits were obtained at the current densities indicated below.

2-Mercaptobenzothiazole Concentration oz/gallon	*Current Density Bright Range* amp/sq.ft.
0.040	5–30
0.054	4–60
0.067	5 to over 70
0.134	6 to over 70

5 Claims, 6 Examples.

No. 2,429,976, October 28, 1947—Electrolyte for and Method of Anodically Polishing Nickel—C. L. Faust, assignor to Battelle Memorial Institute.

CLAIM 1. An electrolyte for use in the anodic polishing of nickel comprising from 5 to 85 per cent by weight of sulfuric acid and from 5 to 85 per cent by weight of orthophosphoric acid, the combined content of these acids being at least 50 per cent but not over 90 per cent by weight of said solution, 0.5 to 2.6 per cent by weight trivalent aluminum, and 0.5 to 1.4 per cent by weight trivalent chromium, the balance comprising essentially water.

DATA IN LEGEND: The percentage compositions and operating temperatures of specific baths according to the present invention are tabulated as follows:

	BATH			
	No. 1	*No. 2*	*No. 3*	*No. 4*
H_2SO_4	14.5	14.9	13	10
H_3PO_4	60.6	62.3	56	62
Al^{+3}	2.4	0.5	2.6	2.2
Cr^{+3}	1.3	0.3	1.4	None
Ni^{+2}	0.5–1	0.5–1	0.5–1	0.5–1
Water	Balance	Balance	Balance	Balance
Operating Temperature, °F	175	115–130	115–130	175

6 Claims.

No. 2,428,804, October 14, 1947—Copper Cleaning Composition—Esther M. Terry and M. Kaplan.

CLAIM. A copper cleaning composition comprising approximately 5 parts by weight of sulfuric acid, 4½ parts of 30 per cent hydrogen peroxide, 3 parts of acetic acid, and 87½ parts of water.

1 Claim.

No. 2,429,222, October 21, 1947—Method of Making Contact Wires—R. A. Ehrhardt and R. G. Humphrey, assignors to Bell Telephone Laboratories.

This invention relates to translating materials and devices and particularly to methods of making them.

The objects are to reduce the cost of manufacture contact wires for translators; to improve the electrical contact between the contact wire and its supporting member in assembly; to facilitate the joinder of this wire and the supporting member by soldering or otherwise.

CLAIM 2. The method of preparing contact wire for rectifiers which comprises moving an indefinite length of tungsten wire at a predetermined rate through an electrically

energized cleaning bath containing an agent suitable for cleaning and etching the wire, said wire being made the anode in the cleaning bath, rinsing said wire, moving said wire through an electrolytic bath including a nickel salt and hydrochloric acid for cleaning the wire and giving it a strike coating of nickel, said wire being made the cathode in said electrolytic bath, rinsing said wire, moving said coated wire at a predetermined rate through a second electrolytic nickel plating bath for depositing on said strike coating a plating of nickel of substantial thickness, moving said plated wire at a predetermined rate through a third electrolytic bath containing gold for depositing on said nickel plating a plating of gold of substantial thickness, and subjecting said plated wire to a heat treatment of 710° C to cause a portion only of the gold plating to alloy with the nickel plating, to cause a portion only of the nickel plating to alloy with the tungsten body of the wire, and to cause a portion only of the gold plating to alloy with the nickel plating.

5 Claims.

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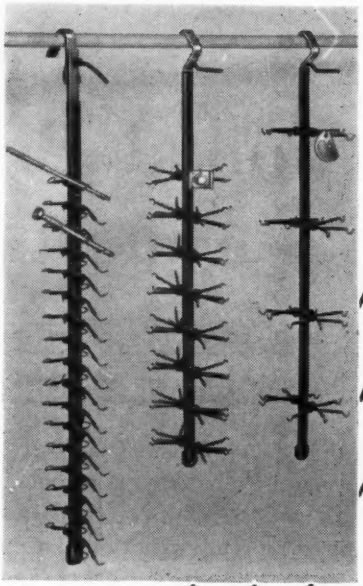

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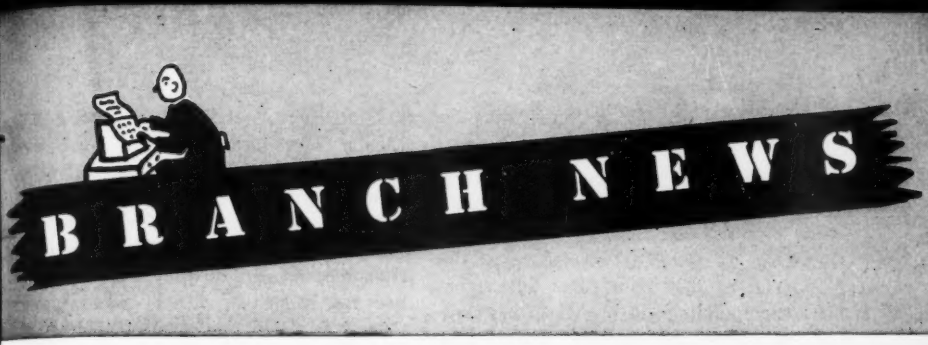

Coming Events

BOSTON BRANCH

The thirteenth annual meeting will be held on Saturday, April 17, 1948. Reserve the date.

GEORGE P. SWIFT, *Secretary.*

DETROIT BRANCH

EDUCATIONAL SESSION
and DINNER-DANCE

December 6 in Hotel Statler

2:00 P. M. Symposium on Plating Plant Engineering, A. E. S. Past President Walter J. Pinner in the chair.

(1) "*General Plating Plant Engineering*" by L. Moye, Engineer, The Utley Company

(2) "*D. C. Power Transmission and Piping*" by George L. Nankervis, President, George L. Nankervis Company

(3) "*The Practical Significance of Good Power Transmission*" by L. C. Borchert, Technical Manager, Houdaille-Hershey Corporation

(4) "*Ventilation*" by Victor P. John, Manager, Industrial Division, American Blower Company

(5) "*Filtration*" by G. M. Cole, Chemical Engineer, Fisher-Body-Ternstedt Division, General Motors Corporation

7:00 P. M. Dinner-Dance and Entertainment. Tickets at $7.50 each may be had from

F. L. CLIFTON, *Secretary-Treasurer.*

GRAND RAPIDS BRANCH

ANNUAL EDUCATION SESSION
AND DINNER DANCE

Pantlind Hotel—January 24, 1948

Educational Session

Furniture Club Room—2:00 P. M.

CHAIRMAN
Mr. Kenneth M. Huston
Supreme President A. E. S.

SPEAKERS

Mr. Robert M. Wagner
Superintendent of Manufacturing Processes,
Guide Lamp Division
General Motors Corporation
Subject to be announced

Dr. Walter R. Meyer
Technical Director, Enthone, Inc.
"Preparation of Metals for Electroplating"

Dr. Harold J. Read
Associate Professor of Mineralogy,
Pennsylvania State College
"The Microstructure of Thin Deposits"

Dinner Dance

Main Ballroom—7:00 P. M.

Mr. J. J. Hanney, Ticket Chairman
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Capacity 500. Get your tickets early.

JACOB M. HAGE, *Secretary.*

BALTIMORE-WASHINGTON BRANCH

DR. D. GARDNER FOULKE of Hanson-Van Winkle-Munning Company, Matawan, N. J., spoke on "Periodic Reverse Current Electroplating" at the October meeting at the National Bureau of Standards. Interesting photomicrographs were shown to illustrate the structure of the deposits. Thirty-eight were present.

GRACE RIDDELL, *Secretary.*

BUFFALO BRANCH

MR. E. R. BOWERMAN of Sylvania Electric Products spoke about "Engineering in the Plating Room" at the October 10 meeting.

Mr. Bowerman's talk struck home with all who heard him because he stressed efficiency in the plating room through proper design of equipment. He covered such subjects as ventilation, heating, electrical power supplies, filtration, and plumbing. The talk was illustrated with lantern slides.

The discussion that followed brought out many of the legal aspects of ventilation in the plating room. The disposal of plating room wastes also received a goodly share of attention.

Any of the branches who have not as yet heard Mr. Bowerman should strive to do so. He has a wealth of experience and knowledge which will leave an impression upon anyone who is interested in commercial electroplating.

H. A. FUDEMAN, *Secretary.*

BRIDGEPORT BRANCH

Forty-six members and guests were present a the October 3 meeting.

CHARLES TEMPLE, Chairman of the Membership Committee, reported five applications for membership. One applicant was elected.

PRESIDENT GOTTHARDT and A. R. MCNEIL are to investigate the purchase of a slide projector and report at the next business meeting.

CHARLES L. TEMPLE, A. R. MCNEIL, CARL SCHAEFER, and H. M. GOLDMAN were appointed to the Constitution Revision Committee.

LIBRARIAN A. J. CHENIS showed *Date Line of Tomorrow*, a picture with sound of the progress in the Aluminum Industry during the past twenty-five years.

JOSEPH GANIM suggested the possibility of forming a plating class in the Central High School, sponsored by the Bridgeport Board of Education. An instructor, JERRY DELANEY, would take care of a class providing that a minimum number of fifteen would attend. Jerry Delaney will attend one of our meetings and state his views.

JOSEPH G. STERLING,
Secretary-Treasurer.

BRIDGEPORT BRANCH

An Open Meeting and Educational Session was held on October 17 in Burrough's Public Library Auditorium. In the absence of PRESIDENT F. B. GOTTHARDT, VICE-PRESIDENT C. L. TEMPLE opened the meeting with sixty-one members and guests present.

TECHNICAL CHAIRMAN A. J. CHENIS introduced MR. J. H. SHOEMAKER of the Kolene Corporation of Detroit, Mich., who presented a paper describing the Kolene process. This process makes use of molten salt, heated by electric immersion heaters or gas-fired equipment, as a dip or electrolytic treatment for cast iron, gray iron, alnico, etc., in preparation for electroplating, brazing, and silver soldering.

The talk was supplemented with slides showing photo-micrographs of treated specimens and also installations throughout the country. A considerable amount of discussion followed.

JOSEPH G. STERLING,
Secretary-Treasurer.

CHICAGO BRANCH

The Chicago Branch continued its monthly meetings during the summer. The July meeting was devoted to Delegates' reports of the Convention and discussion of the proposed Constitution. A short movie dealing with rayon manufacture completed the meeting.

At the August meeting, our Secretary, MR. J. ANDRUS, delivered a very good paper on anodizing aluminum. The talk was illus-

trated with slides and exhibits of various applications of anodizing.

The September meeting was devoted to conversion coatings on zinc plated articles. Our former librarian, MR. W. C. CARTER, gave an excellent account of the chromate coatings. The paper was complete with data on salt spray resistance to formation of white corrosion products and to complete failure by the formation of rust.

There was a very large attendance at the October meeting when MR. JOSEPH NILES spoke about modern brass plating. A lively discussion followed and the members felt that the subject had been thoroughly covered.

J. H. MONAWECK, *Librarian.*

COLUMBUS BRANCH

Some forty members and guests, among whom were MR. JOHN IRELAND, Manager of the Tin Research Institute of Greenford, England, and DR. ERNEST S. HEDGES, Scientific Director of Research of the Tin Research Institute, attended the meeting in Battelle Memorial Institute on October 3.

The speaker of the evening, DR. R. A. SCHAEFER, Director of Research, the Cleveland Graphite Bronze Company, presented some interesting details of the development of electrodeposition of lead, tin, silver, and their alloys on bearing surfaces.

A very short business meeting followed Dr. Schaefer's address.

ARCH B. TRIPLER, JR.,
Second Vice-President.

GRAND RAPIDS BRANCH

Our second meeting of the 1947–1948 season, held at the Grand Rapids Varnish Corporation on October 10, was a plant visitation.

The members were taken on a tour of the Corporation's new offices and laboratory building and were highly impressed by the greatly expanded facilities, including fine laboratories and space devoted to compounding, physical testing, research, etc. After the tour, MR. WAYNE FULLER, Research Chemist, presented a timely and interesting talk on testing of organic finishes.

Refreshments were served by the Corporation.

JACOB M. HAGE, *Secretary.*

JACKSON-LANSING BRANCH

The first meeting of the 1947–1948 season was held September 9, 1947 in Hotel Porter, Lansing. This meeting inaugurated a new system: The Annual Educational Session and Party are to be foregone to allow more emphasis to be placed on the monthly meetings. Individual companies supplying the metal finishing industry have been requested to sponsor meetings and help make a particular meeting successful from a standpoint of attendance, attractiveness, pleasure, and educational value.

Frederic B. Stevens, Inc., were the sponsors of this, the first meeting. After an excellent dinner and a good cigar, MR. L. R. EASTMAN, Manager of the Composition Department, discussed "New Developments in Polishing and Buffing." His talk encompassed the field of buffing and polishing compositions, and was highlighted by a call for finish standards.

The second feature was a talk by MR. G. A. CUMMINGS of the Engineering Department on "The Electric Side of the Plating Plant." He brought out the surprising savings that can be made with an up-to-date generator and, with the use of slides, explained how the savings were effected by modern design. His discussion was very instructive to those of us who have taken the direct current source for granted.

Many favorable comments were heard after the meeting about both speakers and sponsor.

U. J. FORSYTH,
Secretary-Treasurer.

LANCASTER BRANCH

The regular monthly meeting was held Friday, October 10, in the Stevens Trade School. In the absence of our president, the meeting was called to order by VICE-PRESIDENT CHARLES SNYDER. There were twenty-five members and guests present.

Two applicants were elected to membership, and two applications were referred to the Board of Managers.

Our Librarian, CHESTER SMITH, introduced the speaker, MR. A. E. CARLSON of the General Chemical Company, who spoke about "High-Speed Plating from Fluoborate Solutions". He first discussed the process for making the master disc used in phonograph record manufacturing in which copper is deposited from a copper fluoborate solution on a plastic disc to a thickness of 0.030 inch. Plaques are made in the same manner. Mr. Carlson passed among the group a few plastic articles that had been plated in a copper fluoborate solution. Some of the advantages of a fluoborate solution are: the operation is simple (hot or cold), composition of the bath is not critical, and higher current densities are permissible. Slides were used to show the composition of different fluoborate baths and the properties of the deposits under certain conditions.

H. CLAY BRUBAKER, *Secretary.*

LOS ANGELES BRANCH

The October meeting was held at Scully's on Monday, October 13, with approximately seventy-five members and guests attending.

TREASURER GEORGE KENT reported that eighteen members were more than one year in arrears for dues and forty-eight members delinquent for a year or less, a total of sixty-six members whose delinquency amounts to $483 at this time.

EARL COFFIN announced the appointment of the 1948 Banquet Committee and summarized the work to date.

Speakers of the evening were the Los Angeles delegates to the Detroit Convention. JACK RASKIN reviewed a number of the more interesting and pertinent papers presented at the Educational Session.

LEO ATIMION described some of the procedures used in the East, emphasizing the method of disposing of industrial waste used by the Electrolux Company in Stamford, Conn.; the burnishing methods used in the manufacture of jewelry at Providence, R. I., and Attleboro, Mass.; and the research work being done in the Detroit area. DON BEDWELL told of his experiences and observations at the Crane Company in Chicago and the Ternstedt Division of General Motors in Detroit, covering in some detail the plating procedures used on zinc die castings.

The Question Box contained the following:

Q. 1. What is the formula for the nickel strike used in replating rejected plated steel parts? A. Nickel chloride, 25 oz/gal; Nickel sulfate, 8 to 10 oz/gal; *p*H, about 1. Strike for 30 seconds.

Q. 2. How heavy a plate is used on plumbing goods? A. Normally not less than 0.0003 inch.

Q. 3. How much current is used in chromium barrel plating? A. At 10 to 12 volts a three-pound load will draw about 400 amperes.

Q. 4. In the sodium zincate process for preparing aluminum for plating, can anything but carbon brick be used for the hydrofluoric-nitric dip? Can cast alloys be plated satisfactorily without using this dip? A. Apparently not.

Q. 5. When pickling high-carbon galvanized steel wire to remove rust and scale, is it possible to remove the smut formed on the wire so as to permit plating? A. Try concentrated nitric acid, cut with zinc and diluted to 20 per cent with water.

The Branch voted to approve the amendment raising the annual dues by two dollars. DON BEDWELL, WALTER BEHLENDORF and ROY LOSTUTTER were appointed to the New Constitution Committee.

AL SPESER and FRANK RUSHTON were reported as still being hospitalized.

DEAN D. WILLIAMS, *Secretary.*

MILWAUKEE BRANCH

The Milwaukee Branch held its 381st regular meeting on October 3, 1947. MR. WILLIAM GEISSMAN was elected committee chairman for the 1949 National Convention in Milwaukee. MR. LES DIVELY, in a statement on the progress of the electroplating classes at the Vocational School, reported that classes are full and there is a waiting list. DR. CHESTER of Poor and Company was the evening speaker. His subject, "The Alchemy of Electroplating", proved very interesting. He reviewed the history of

electroplating and challenged present-day platers to push forward in this field which has shown much progress but still offers much opportunity for improvement.

JAMES DURNFORD, *Secretary.*

MONTREAL BRANCH

Sixteen members were present when MR. P. M. COADY of the RCA Victor Company addressed the October 7 meeting on "Electroless Plating". Following a short review of the history of the process, he explained the theory of plating without the electric current by reduction of a metal salt with sodium hypophosphite, the reaction being catalyzed by certain base metals. The speaker, assisted by MR. J. D. FAIRBAIRN, then gave a demonstration by plating bright nickel on steel. Mr. Coady closed by outlining the limitations of the process.

WILLIAM GLOVER, *Secretary.*

NEW YORK BRANCH

One application for membership was received and six new members elected at the regular meeting on October 10. The Executive Board outlined a program for the near future which received unanimous approval. LIBRARIAN MARTIN MAHER conducted the question box which, as usual, created a lively discussion.

Five more applications for membership were received and another member was elected on October 24. At this meeting Librarian Maher introduced the two extemporaneous speakers. MR. GEORGE HERRMAN, a member of this Branch, gave a most fascinating talk on "A Plater's Method of Solving a Tough Engineering Problem," which dealt with the intricacies of diamond dental burr manufacture.

MR. MILTON NADEL, also a member of this Branch, described the manufacturing obstacles that had to be overcome in the mass production of finished Venetian blind stock and steel tape rules.

ALBERT C. FUSCO,
Recording Secretary.

PHILADELPHIA BRANCH

PRESIDENT ORLIK called the October meeting to order with fifty members present.

Ten applications were referred to the Board of Managers, and three applicants were elected to membership

NAT VERRELLE reported GEORGE GEHLING sick in the Episcopal Hospital, Philadelphia.

LIBRARIAN HIRSCH introduced MR. JOSEPH MAZIA, Metallurgist, American Chemical Paint Company, Ambler, Pa., a member of the Branch, whose subject was a "New Method of Preparing Zinc Alloy Die Castings for Plating". Mr. Mazia began by giving the compositions of the castings and the reasons therefore, the different methods of polishing and preparatory methods used in and around Detroit. He then discussed his company's new product, an acid emulsion type cleaner used at 140° F prior to the conventional mild alkali type, which this writer saw demonstrated in a Detroit plant during the Convention Week. It is especially useful where a baked enamel finish is used after plating.

PAUL MENTZER, SR., *Secretary.*

PITTSBURGH BRANCH

The attendance at the October 9 meeting in the Keystone Hotel was about sixty, of which thirty-five were present at the dinner which preceded the meeting. Not less than three National Officers, FIRST VICE-PRESIDENT JOHNSTON, SECOND VICE-PRESIDENT LOGOZZO, and EXECUTIVE SECRETARY GRAHAM were there.

FRANK KELLER reported on the work of the Branch's Constitution Revision Committee. Mr. Logozzo discussed the work of the National Constitution Revision Committee, of which he is chairman. PRESIDENT HENNESSY told of the Referendum Vote being taken on an amendment to the Constitution which will increase the annual dues by $2.00 per year, the additional amount to go to the National Society. The Branch voted unanimously to instruct our three delegates to vote in favor of this amendment. DR. LANCY discussed the courses in electroplating initiated by the Pittsburgh School of Plastics.

Twelve new members were elected.

LIBRARIAN GOLDBACH then introduced Mr. Arthur W. Logozzo of the Nutmeg

Chrome Corporation, A. E. S. Second Vice-President, who spoke about "Bright Nickel and Decorative Chromium Plating". He showed a wide acquaintanceship with practical methods and illustrated his talk with slides of various cleaning, pickling and plating practices, as well as racking arrangements for carrying out the cycles without unracking or polishing. He answered a great many questions which were asked during the discussion period.

The display this month was by the *East Liberty Electroplating Company* and included a wide variety of plated articles.

RICHARD A. DIMON,
Secretary-Treasurer.

PROVIDENCE-ATTLEBORO BRANCH

MR. L. G. CHESWORTH of United Carr Fastner of Boston was the speaker of the October meeting.

His paper, "Barrel Bright Nickel and Zinc Plating", covered in full detail all points which differed from the usual barrel plating, namely, current density, brightener content, temperature, and electrolytic purification. It was based on a year and a half of experience with large scale production.

EDWARD A. PARKER, *Secretary.*

ROCHESTER BRANCH

Seven applicants were elected to membership at the October 17 meeting.

MICHAEL PAVONE has returned from Military Service and was reinstated.

LIBRARIAN CHARLES HENDERSHOTT introduced the speaker, MR. SIEFFEN of the J. J. Sieffen Company, who spoke about "Sprayed-on Buffing Compounds and Abrasives". The technique of using emulsified compounds in a gun mounted over the buffing wheels and the numerous applications of this method were brought out. The advantages of this method and time and cost comparisons against other methods of applying compounds were emphasized.

Forty-seven members and guests were present and asked Mr. Sieffen numerous questions.

JAMES E. WEAVER, *Secretary.*

ST. JOSEPH VALLEY BRANCH

There were twenty-seven present at the dinner and thirty-one at the technical session on September 3. Hotel Elkhart was designated as the permanent meeting place of the Branch.

MR. L. E. WEEG introduced DR. R. A. SCHAEFER of the Cleveland Graphite Bronze Company who gave a talk on silver, lead and lead-tin plating, illustrating the talk with slides. He then showed movies of the processes used at Cleveland Graphite Bronze Company for making bearings.

HAROLD J. WIESNER,
Secretary-Treasurer.

ST. JOSEPH VALLEY BRANCH

The regular monthly meeting was held on October 1 at the Hotel Elkhart. Forty members and guests attended the dinner. There were forty-four at the business and technical session.

One application for membership was approved, and three new applications were received.

LIBRARIAN V. E. PETERSON introduced the speaker for the evening, MR. C. W. CARTER of United Chromium, Inc. Mr. Carter gave a very excellent paper on "Hard Chromium Plating," which covered methods of preparation of basis metals, solution composition and operating conditions, and plate thicknesses recommended for various types of parts.

An interesting question period followed.

HAROLD J. WIESNER,
Secretary-Treasurer.

SAN FRANCISCO BRANCH

A regular monthly meeting was held in the El Curtola Restaurant, Oakland, on October 9. Fourteen members and one guest attended.

MR. E. MARCUM, Technical Director, Western Division, E. I. du Pont de Nemours & Company, gave a comprehensive and well-presented talk on "High Speed Bright Zinc Plating," illustrated with slides.

DELEGATE PATTENGER was instructed to vote in favor of the proposed $8.00 annual dues. Members of San Francisco Branch are in favor of retaining the old constitution

"as is", with such amendments as may be deemed necessary in the future.

PRESIDENT FRED HUNTINGTON appointed as a committee to plan a Christmas party J. R. PATTENGER and FRANK CAVALLERA.

JACK HITE, *Secretary-Treasurer.*

SOUTHEASTERN BRANCH

The meeting on October 15 at the Roebuck Country Club proved a huge success. Following a tasty chicken supper, the forty members and guests had the opportunity to listen to MR. K. G. COMPTON, Bell Telephone Laboratories, Inc., New York City, discuss "Corrosion of Metallic Protective Coatings". His talk was amply illustrated with slide pictures and led to a lively discussion. As an added feature, Mr. Compton showed pictures taken on his trips to India, Japan, and other foreign countries during the war. They were enjoyed by all.

MESSRS. H. R. STOGNER, CLEM HOHNER, and CHARLES WOOLFOLK were appointed to serve as a committee to study the A. E. S. Constitution and By-Laws.

WILLIAM T. WEYMOUTH,
Secretary-Treasurer.

SPRINGFIELD BRANCH

The meeting on September 22 began with a three-minute talk by MR. ARTHUR ZAVARELLA, member of this branch, on "Sulfoalkane Copper Solution". LIBRARIAN JOHN HORRIGAN then introduced MR. RALPH MCCAHAN of E. I. du Pont de Nemours & Company who gave a very interesting talk on "Trouble Shooting Cyanide Plating Solution." A question period followed which pleased both the practical plater and the technical man.

LAURENCE R. FOUNTAIN,
Secretary-Treasurer.

TWIN CITY BRANCH

Thirty-eight members and guests attended the dinner meeting on October 6.

MEMBERSHIP CHAIRMAN RAY KRIEGER introduced the first woman member of the Branch, MISS FRANCES J. SAINS of Lewis Metal Plating Company.

It was decided to continue to hold the dinner meetings at the Covered Wagon Cafe.

LIBRARIAN C. A. BOWMAN introduced MR. JOSEPH MAZIA of American Chemical Paint Company who spoke on "Electrolytic and Pickle Polishing". Mr. Mazia illustrated his talk with an actual demonstration and answered several questions from the members.

BOB BUCKLEY,
Secretary-Treasurer.

ABSTRACTS (*Continued from page 1366*)

was concerned with Type T.45, a manganese steel, and DTD.178A, a chromium-molybdenum steel.

The experimental work included studying methods of adapting electropolishing for use as a process in the machine shops. In one application the internal surfaces of a steel cylinder were required to be honed to a glass-like finish. Electropolishing was directed toward reducing production time.

The author closes with remarks on the measurement of surface finish along the lines of profilometer analysis.

For general discussion of the mechanism of electropolishing, reference is made to papers by S. Wernick*, P. Jacquet†, and Imboden and Sibley‡.

In comment on this paper, it can be added that there are conditions for producing mirror-like finishes on high carbon steels and on steels containing appreciable amounts of tungsten and molybdenum by electropolishing in sulfuric-phosphoric acid solutions. Surface smoothening measurements, which have been of interest to the abstractor, reveal that electropolishing an average thickness of 0.001 inch from a surface showing a profilometer measurement of 50 rms, reduces the roughness reading to about 25 rms, and removal of another 0.001 inch reduces the roughness further to about 12 rms. The smoothness can be brought to about 2 rms when clean steel is used.

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*J. Electrodep. Tech. Soc. **18**, 103–120 (1943).

†Comptes rendus **201**, 1473 (1935).

‡Trans. Electrochem. Soc. **82**, 227 (1942).

RECTIFIER "PACKAGES" PROVIDE NEW FLEXIBILITY AT HARTFORD CHROME CORPORATION

Addition of two "2000" units speeds handling of varied plating jobs

Continuing its program of adding dependable, easy-to-use rectifier equipment to meet expanding requirements for plating power, the Hartford Chrome Corporation has recently installed two new General Electric "2000" copper-oxide rectifiers and control equipment. These power "packages," consisting of a fan-ventilated rectifier and an operator's control, have proved invaluable in providing the flexibility needed for an ever-changing variety of work.

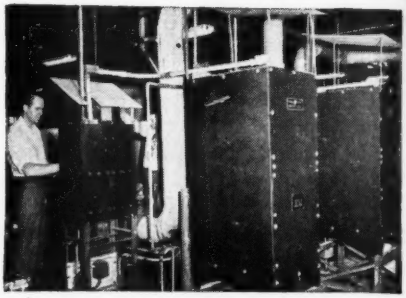
The rectifiers are installed away from working areas, free from injurious fumes. A handy, at-the-tank operator's control governs all operations, permitting instant changes in power input as they are required.

Each rectifier delivers to the plating tank 2000 amperes on one set of bus bars, or 1000 amperes on each of two sets of bus bars. It is also possible to connect the rectifiers in series, to deliver 4000 amperes. Future plans call for the addition of fully automatic motor-operated controls that will keep output voltages constant from "no load" to "full load" within ± 2 per cent of selected reading.

General Electric Equipment Selected on Basis of Past Performance

With the addition of these units, Hartford Chrome now has 12 General Electric rectifiers, with a total rating of 9000 amperes. Most of the equipment has been in operation for four to five years.

During this time, maintenance costs have averaged 25 to 35 per cent lower than those before General Electric rectifiers were installed. On the basis of upkeep, performance, and flexibility, to meet various needs of plating and anodizing, General Electric equipment has proved to be the most economical and efficient that this active plant has ever used.



View shows how rectifiers have been placed in open, nonworking area. Units are easily accessible for cleaning or repair, and are protected from dirt and vapor fumes.

Economies For Your Plant

General Electric copper-oxide rectifiers and controls are readily available in many sizes and capacities, to solve plating or anodizing problems in your plant. They offer many advantages that go a long way in keeping production costs low.

Call on us for engineering assistance, too. We may be able to show you important operating economies, based on the use of efficient General Electric plating equipment.

For information, or for your copy of *General Electric Copper-oxide Rectifiers and Controls*, write to Section A75-1168, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

ARTHUR W. LOGOZZO
Chairman, Membership Committee

ELECTIONS

BRIDGEPORT BRANCH: William A. Ross

DAYTON BRANCH: John K. Easton, Kermit E. Froebe, J. G. Walker

DETROIT BRANCH: L. A. Danse, William L. Herrman, A. O. Ihormahlen, R. C. Rogge, W. W. Shapiro, O. H. Tiedeman

JACKSON-LANSING BRANCH: Howard K. Brown, John O. Chandler, Harold C. Marsh, Ealum H. Spraker

LANCASTER BRANCH: Richard E. Field, Henry J. Schneider

MILWAUKEE BRANCH: Arthur J. Hocevar, Edwin S. Lev

NEW HAVEN BRANCH: Francis J. Antinovitz, Donald F. Kinckiner, Francis J. Malone, Francis J. Murphy

NEWARK BRANCH: Walter J. Ehrlinger, Ralph A. Heiss, Richard C. Henkel, Charles B. Little, Eugene Marchione, Herbert R. Pitts, George I. Reuter, John E. Trumbour, Daniel W. Woolley, Jr.

NEW YORK BRANCH: Seymour Berman, Angelo F. Congemi, James Dimen, Harry W. Goodall, Harvey S. Levine, Ernest Moll, Joseph Novitsky, Lester S. Wolf

PHILADELPHIA BRANCH: Richard Blumberg, William J. Johnson, Robert P. Stafford

PITTSBURGH BRANCH: John L. Collins, Howard A. Irvine, Harold E. Ketchum, Lawrence J. Kisner, Carl L. McHattie, H. W. Peters, Emil Polivka, Gus J. Schaffner, Jr., Norman Shorr, Pablo A. Sacerdote, R. A. Woofter, Richard J. Zaiden

PROVIDENCE-ATTLEBORO BRANCH: George Breault, John H. Broadbent, Jr., Robert F. Crook, George W. Muir, Benjamin J. Perkoski, Rocco Velletri

ST. JOSEPH VALLEY BRANCH: John C. Bayman

SAN FRANCISCO BRANCH: Emil M. Kachman, Nick P. Premenko

SOUTHEASTERN BRANCH: George W. Taylor

SYRACUSE BRANCH: Edward Noxon, James G. Stevens, Harry Watters

TOLEDO BRANCH: Hugh E. Bennes, Frank Criscio, Samuel Criscio, Paul Dressel, Wallace E. Friedel, Rolland M. Guides, Paul Mirabello, Joseph Rocco, Donald Whittenburg

TWIN CITY BRANCH: Sherman G. Jensen, F. L. Mickelson, F. J. Sains, P. Warner

REINSTATEMENTS

ROCHESTER BRANCH: Michael Pavone

SYRACUSE BRANCH: A. A. Gutekunst

TRANSFERS

John T. Donaldson from New Haven Branch to Bridgeport Branch; D. F. Mosher from Dayton Branch to Cleveland Branch; Robert D. Miller from Dayton Branch to Cincinnati Branch; D. T. Ewing from Detroit Branch to Jackson-Lansing Branch; R. L. Thebaud from Chicago Branch to St. Joseph Valley Branch (previously published from Chicago to Detroit Branch); Carl Cartlege from Southeastern Branch to Detroit Branch; Donald A. Hilliard from Waterbury Branch to Chicago Branch

SUSPENSIONS

CLEVELAND BRANCH: Paul V. Rebel, Stayton G. Todd
DETROIT BRANCH: A. B. Wilson
JACKSON-LANSING BRANCH: W. H. Bennett, C. H. Blacklidge, B. A. Fager, Bronson E. Howard, Joseph McCluskey, B. H. Wright
NEW YORK BRANCH: Oscar Harding, Joseph Linn, Nils P. Wikner
PROVIDENCE-ATTLEBORO BRANCH: Roger Amantea
ST. JOSEPH VALLEY BRANCH: Wayne Cone, Donald Cook, Donald First, L. Hofferbert
SOUTHEASTERN BRANCH: Charles M. McDonald, Durwood Smith
SPRINGFIELD BRANCH: A. W. Woods
SYRACUSE BRANCH: Dan Dissoway, Jack Harnett, Peter J. Vercillo
TORONTO BRANCH: Jack W. Miller

RESIGNATIONS

JACKSON-LANSING BRANCH: R. E. Quick, L. C. Surato, C. E. Topping, Eric Windfuhr
MILWAUKEE BRANCH: Frederic Barber, Joseph M. Palleck
NEW YORK BRANCH: Louis Holland
PITTSBURGH BRANCH: Richard Rimbach, Clarence W. Holmes
ST. JOSEPH VALLEY BRANCH: Harry Dietrich, Henry Welling
SAN FRANCISCO BRANCH: Carl W. Kuba, James F. Upchurch
TORONTO BRANCH: Stewart McLeod
TWIN CITY BRANCH: Joseph B. Bambenek

DEATHS

JACKSON-LANSING BRANCH: D. M. Bennett
ROCHESTER BRANCH: Frank E. Schwind

Results of Referendum Vote

The referendum vote on the amendments of the By-Laws to increase the dues by $2.00 per member per year has given the following results:

"*By-Laws Part I, Supreme Society. Articles VI, Duties of Branch Societies, Section 3, Amount of Per Capita Tax.* (a) Effective February 1, 1948 for new members and May 1, 1948 for members in good standing on December 31, 1947, a per capita tax of $4.70 per annum shall be contributed by each branch to defray the expenses of the Supreme Society."

For 58 *Against* 27

"*By-Laws Part II, Branch Societies. Article VI, Dues, Section 1, Minimum Dues.* (a) The minimum annual dues shall be $8.00 per year and may be paid quarterly, semi-annually or annually."

For 60 *Against* 30

A two-third vote is required for passage. Therefore, the amendments to the By-Laws Part I and Part II have both passed.

NEW A. E. S.
RESEARCH REPORT
Serial No. 5

Dr. Thon's admirable critique of methods for determining

The Adhesion of Electrodeposits

40 pages—80 cents
Discount for quantity

Send check with your order to

American Electroplaters' Society

P. O. Box 168, Jenkintown, Pa.

MEMBERSHIP REPORT

BRANCH	Membership May 1, 1947	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
LOS ANGELES	198	22	+20	+10.1
BOSTON	160	17	+13½	+ 8.4
CHICAGO	410	32	+26	+ 6.3
BRIDGEPORT	147	11	+ 6	+ 4.1
PHILADELPHIA	218	18	+ 7½	+ 3.4
CLEVELAND	192	13	+ 5½	+ 2.9
GRAND RAPIDS	136	16	+ 2½	+ 1.8
WATERBURY	139	2	+ ½	+ 0.4
TORONTO	144	5	+ ½	+ 0.3
NEWARK	257	22	− 1	− 0.4
HARTFORD	141	1	− ½	− 0.4
NEW YORK	259	15	− 1½	− 0.6
DETROIT	423	30	−20	− 4.7
SECOND GROUP				
PITTSBURGH	126	22	+16½	+13.1
NEW HAVEN	114	9	+10½	+ 9.2
ROCHESTER	88	5	+ 6	+ 6.8
ST. LOUIS	96	5	+ 5	+ 5.2
SAN FRANCISCO	77	6	+ 3½	+ 4.5
TWIN CITY	89	5	+ 4	+ 4.5
BUFFALO	98	3	+ 2½	+ 2.5
MILWAUKEE	124	8	+ 1	+ 0.8
ST. JOSEPH VALLEY	88	7	+ ½	+ 0.7
PROV.-ATTLEBORO	126	15	.....	.....
BALTIMORE-WASH.	119	9	− 1	− 0.8
DAYTON	95	4	− 1	− 1.1
INDIANAPOLIS	103	16	−11½	−11.3
THIRD GROUP				
ADELAIDE	49	14	+13	+26.5
TOLEDO	55	13	+12	+21.8
SYDNEY	78	16	+12	+15.4
SPRINGFIELD	73	4	+ 2	+ 2.7
LANCASTER	38	4	+ 1	+ 2.6
SYRACUSE	73	3	+ 1½	+ 2.1
COLUMBUS	35	6	+ ½	+ 1.4
CINCINNATI	52	2	.....	.....
MELBOURNE	61	..	.....	.....
ROCKFORD	64	4	− 2	− 3.1
MONTREAL	60	1	− 2	− 3.3
SOUTHEASTERN	43	4	− 1½	− 3.5
JACKSON-LANSING	65	4	− 7½	−11.5
TOTAL A. E. S.	4,913	393	+126	+ 2.6

Membership, November 10, 1947....5,039

BARREL NICKEL PLATING *TO SPECIFICATION!*

USING

SEYMOUR BRIGHT NICKEL PROCESSES

Where specific thicknesses of bright nickel plate are desired, use Seymour "NC" or "CK" Bright Nickel Processes in a warm plating bath. The warm type brightener solution permits specification barrel nickel plating of any desired deposit from .0002" to .0010", and at a speed four to six times faster than with a cold solution.

Seymour Barrel Nickel Brightener solutions are also available for cold plating baths where only a decorative deposit of about .0001" maximum is required.

Both warm and cold type brighteners are simple to maintain and easy to control. Deposits from both are adherent to properly cleaned base metals, except zinc base direct, and may be chromium plated without prior buffing or wiping.

Write for bulletins containing complete information.

THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONNECTICUT

Nonferrous Alloys Since 1878

SEYMOUR

Check the Outstanding Advantages of

MEAKER

Full Automatic Plating Machines

STRAIGHT-A-WAY RETURN TYPE

1. Economy of Operation

. . . all heavy, tiresome, messy work is done by the machine.

2. Better Quality

. . . close coupled processing sequence readily lends itself to more careful supervision and control.

3. Maximum Output

. . . heavy duty and carefully engineered design insures uninterrupted production schedule.

★

MEAKER PROCESS GALVANIZING LINES
For
Strip Steel **Round Wire**

★

SEMI-AUTOMATIC PLATING MACHINE

THE MEAKER COMPANY

1629–41 South 55th Avenue
Chicago 50, Illinois

INDUSTRY NEWS

Job Shop Operations

According to the September issue of the *Monthly Bulletin of the Masters' Electro-Plating Association*, New York City, rate of operations in September shows the first increase in many months: 55 per cent against 48.5 per cent in August, 1947 and 80½ in September, 1946.

Jade Powder for Polishing Hard Materials

Suitable for polishing extremely hard materials, extra fine, fast, and very tough *Jade Powder* is intended to ease and speed mirror polishing of various hard metals, most jewel and mineral matter, and other materials less hard than the diamond. It is available in four grits: *No. 3* (2 microns average diameter of the particles), *No. 2* (5 microns), *No. 1* (8 microns), and *No. 0* (the coarsest, 12 microns), and may be obtained from *Linick Chemical Company*, Suite 1612, 29 E. Madison Street, Chicago 2, Ill.

Filter Equipment

Titeflex, Inc., 628 Frelinghuysen Avenue, Newark 5, N. J., has published a 4-page catalog *No. 120* which describes and depicts Titeflex industrial filter equipment for the plating industry and other industries where filtration is required. Photographs of three models of filters are shown and their features are concisely discussed.

Abrasive Belt Grinders

Four-page bulletin *No. GP-1*, offered by *Hill Acme Company*, 6457 Breakwater Avenue N. W., Cleveland 2, Ohio, describes and illustrates three types of endless abrasive belt grinding and polishing machines for processing flat surfaces. Photographs show the general appearance of the hydraulic type for sheet stock, pinch roll type for bar stock, and the coiler type for strip.

The Electric Products Company Establishes Three West Coast Offices

To better serve the West Coast, *Gordon J. Berry*, Vice-President of *The Electric Products Company*, 1725 Clarkstone Road, Cleveland 12, Ohio, announces the establishment of District Offices at Portland, San Francisco, and Los Angeles.

FELT DOES IT BETTER

PARAMOUNT BRAND

FELT WHEELS

Quality • Better Work • Uniformity

Order PARAMOUNT BRAND Felt Wheels from your supplier. Also, bobs and sheets whenever you need them.

BACON FELT CO. Winchester, Mass.
Established 1824
"America's Oldest Felt Manufacturer"

WANTED

Research chemist for electroplating. Must have good background and experience for developing plating processes. Prefer young man who is interested in a future with an old established progressive firm. Location Chicago.

Address replies to:

MR-12A, THE MONTHLY REVIEW
P. O. Box 168, Jenkintown, Pa.

POSITION WANTED

Electro- and metallurgical chemist, M. S., age 42, desires responsible executive position in research, development, and/or control laboratory. At present with well-known firm, desires greater opportunity. Excellent background of experience in metal finishing work.

Send replies to:

MR-12B THE MONTHLY REVIEW
P. O. Box 168, Jenkintown, Pa.

WANTED

Chemical Engineer—22 to 40 years old, to operate a production acid copper electroplating plant in St. Louis. This is an excellent opportunity for the right man who has the combined ability to reason out problems and to manage production. Replies confidential. Our employees informed of this ad. State qualifications fully.

Send replies to:

MR-12C, THE MONTHLY REVIEW
P. O. Box 168, Jenkintown, Pa.

HELP WANTED

Salesman—knowledge of plating a requisite, rather than sales experience.

SULPHUR PRODUCTS COMPANY
Greensburg, Pa.

In charge of the Portland Office (342 Sherlock Building) is *Mr. William J. Cottrell*, a graduate Electrical Engineer, who has had extensive experience in the field.

The San Francisco Representative is *Mr. Donald T. Elliott* with offices at 921 Howard Street. Mr. Elliott holds a B.S. Degree in Electrical Engineering from the University of California, and is a member of Tau Beta Pi.

In Los Angeles, the office of The Electric Products Company at 1262 S. Boyle Avenue is under the direction of *Mr. H. D. Easterbrook*. With a 1910 B.S. degree in Electrical

SELENIUM RECTIFIERS

1500 AMPERES of DEPENDABLE POWER!

Model TC 1575 is capable of delivering a combination D.C. output power of 1500 Amperes at 6 Volts, 750 Amperes at 12 Volts. A tapped switch control incorporated in this unit varies the output voltage from 2 to 12 Volts. Although the cost of this economical design is less than 66 cents per ampere, its quality and excellent design is second to none.

Rapid Electric Selenium Rectifiers are given a 25% overload test before leaving our factory and are guaranteed to give continuous satisfactory service.

Custom built units of any size power ratings will be designed and constructed as per your specifications.

All Standard Models are available for immediate delivery. Please write for complete information.

STANDARD MODEL RECTIFIERS

Model	D.C. Amps.	D.C. Volts	A.C. Volts	Phase
1214	15	0–15	115	Single
3424	25	0–6	115	"
5510	50	0–10	115	"
2239	150	0–8	115	"
SPC 2512 T	250	0–8	220	"
SPC 3030	300	0–8	220	"
TNC 5050	500	8	220	Three
TNC 1010	1000	8	220	"
TNC 1575	1500	6	220	"
TC 1575	1500/750	6/12	220	"

RAPID ELECTRIC CO.

2847 MIDDLETOWN ROAD **BRONX 61, N. Y. C., Dept. M**

Engineering from the University of Illinois, he joined Westinghouse Electric Corporation and remained with that company until 1940 when he became a manufacturer's agent.

Buffing and Polishing Machines

A 16-page catalog *B-10* illustrating heavy duty and extra heavy duty buffing and polishing machines covers sizes from ½ to 60 h.p. and the infinitely variable speed control with "*Speedial*". Write to *Standard Electrical Tool Company*, 2477 River Road, Cincinnati 4, Ohio, for your copy.

"pH Tables for Electroplaters"

R. P. Cargille, 118 Liberty Street, New York 6, N. Y., has issued a pamphlet, "*pH Tables for Electroplaters.*" This is a comprehensive tabulation of plating baths, listing the permissible *p*H range with the optimum *p*H for each bath. References to original articles are cited for each process, and information is given regarding how photocopies of these articles may be obtained.

The Tables are issued especially for use with the new *Cargille Set of pH Papers.*

Magnus Offers New Cleaning Equipment

The Equipment Division of the *Magnus Chemical Company, Inc.*, of Garwood, N. J., has recently re-designed and increased with new models its complete line of *Magnus Aja-Dip* (agitates and dips the work) *Cleaning Machine.*

Cleaning with the Magnus Aja-Dip Machines is fully automatic and thorough requiring labor only for loading and unloading. The operator is freed for other duties while the Aja-Dip does the cleaning.

Magnus Aja-Dip Cleaning Machines are available in 13 sizes and types from the Midget type handling a few pounds of work

ZINC PLATERS!

Cleanse & Purify your Zinc Solution with

McKeon's

Zinc-Brite

TRADE MARK REG'D.

Make your Zinc Bright

Information free—wire collect

Sulphur Products Co. Inc.

Greensburg 9, Pa.

TODAY'S BEST BUY

for Setting Up POLISHING WHEELS AND BELTS

GRIPMASTER
PATENTED
POLISHING WHEEL CEMENT

LEADING PLANTS REPORT:

GRIPMASTER BOOSTS POLISHERS' PRODUCTION AN AVERAGE OF 47% MORE PIECES PER HEAD!

Now! **Longer Wheel Head Life!** Thanks to Gripmaster's special high-heat resisting ingredient!

Now! **Fewer Stops for Wheel Changes!** Gripmaster *locks in* grains of emery "vise tight!"

Now! **Inventories Simplified!** One grade grips *all* grains—300 to 20. No special sizer needed!

Now! **Better Finishes!** Greater flexibility gives more and finer "breaks" when wheel is "cracked!"

Now! **Goodbye to S. O.!** There's no Stockyards Odor in Gripmaster. It's clean, odor-free!

GRIPMASTER MEETS EVERY NEED

Gives astounding results on all metals—ferrous and non-ferrous. Ideal for plastics, too!

YOURS FOR THE ASKING

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NELSON CHEMICALS CORPORATION
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Windsor, Ontario

☐ Send us a generous FREE SAMPLE of Gripmaster.
☐ Send us data on how to boost polishing production.
☐ Have a representative call to demonstrate.

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CITY_____ STATE_____

MR 12

to the Jumbo type handling 2,00 pounds at a time. They may be used with either hot or cold cleaning solutions. If heated, heat may be by steam, electricity, oil, gas or kerosene.

Complete information on the Magnus Aja-Dip Cleaning Machines is available by writing to the *Equipment Division, Department MR, Magnus Chemical Company, Inc.*, Garwood, N. J.

Michigan Abrasive Company Names New General Sales Manager

C. H. "Fid" Wills has been named General Sales Manager of the *Michigan Abrasive Company*, Detroit, Mich., *Max C. Jones*, Company President, announced recently.

Mr. Wills will have complete responsibility for the world-wide sales of Michigan Abrasive materials, which include sheets, rolls, discs and belts of all types and sizes. He comes to the Michigan Abrasive Company after ten years as Detroit-Toledo representative for another abrasive company

Air Filters

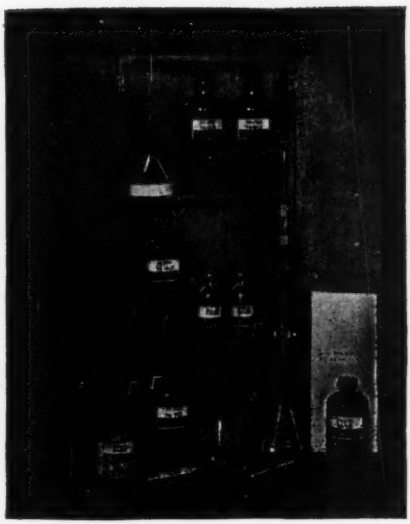
The application of replaceable type air filters for ventilating and air-conditioning systems is explained in an 8-page booklet, *No. 210* which may be had from *American Air Filter Company, Inc.*, 215 Central Avenue, Louisville 8, Ky. Descriptions and illustrations of each type filter are given along with instructions for maintenance and detailed engineering and installation data.

Eco Announces New Line of Gearless Pumps in Stainless Steel, Monel and Bronze

A new line of gearless pumps for general industrial use has been announced by *Eco Engineering Company*, 12 New York Avenue, Newark 1, N. J.

Based on the successful principle of *Eco Gearless Pumps*, which have been in use in the marine field for the past twelve years, the newly designed pumps include several special features and improvements which make them ideal for the handling of practically all types of liquids, acids, solvents, oils, etc. Chief among the improvements is the new double impeller design which gives a strong flow against pressure.

They are available in ¼ and ½ inch sizes, capacities from one to twelve gallons



CHROMIUM
NICKEL
COPPER

Simple test sets for aid in controlling plating and other solutions.

Write for literature.

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CHICAGO 32, ILL.

Specify Kocour Sets from your supplier.

RELIANCE
VARIABLE SPEED
LATHES

Reliance Variable Speed Lathes Cut Costs

There is a RELIANCE LATHE for every need.

Let us quote on your requirements.

Chas. F. L'Hommedieu & Sons Co.

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Plating and Polishing Machinery

Complete Plating Plants Installed

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Wm. R. Shields, Detroit, Mich.
C. B. Little, Newark, N. J.

Branches
LOS ANGELES and
CLEVELAND

per minute varying with pump speeds and pressures. Pumps can be used against pressures up to 50 pounds per square inch. Pumps can be run and will deliver at speeds from 200 to 3500 rpm.

Pickling Inhibitors

How certain acid inhibitors and neutralizing materials promote cost-savings and improved quality production in pickling iron and steel is the subject of a 6-page service report (*No. F-4880-R1*) of *Oakite Products, Inc.*, 157 Thames Street, New York 6, N. Y. A feature is a section containing graphs showing the action of the inhibitors in reducing metal loss. A comparison chart and table shows how they reduce acid consumption and extend life of solutions, and supplementary data include instructions for making up, controlling, and maintaining sulfuric acid and hydrochloric acid solutions.

Brightening and Protective Treatment for Zinc Plate

Features of a process for converting ordinary zinc plate into a brilliant, corrosion-resistant finish, are presented in a new 4-page bulletin on "*Unichrome Clear Dip*" by *United Chromium, Incorporated*, 51 E. 42nd Street, New York 17, N. Y. Advantages to product finishers in using zinc plate together with this chemical treatment are discussed, and the typical production cycle for the process is described.

New High Production Finish Announced by Zapon

A new synthetic production finish, named *Duranite-H*, capable of creating a coating of hitherto unknown hardness, flexibility, chip resistance, ease of handling, and economy, has been announced by the *Zapon Division* of the *Atlas Powder Company*.

The new Zapon coating, which is not formulated from any old line synthetics, is said to cure extremely full and lustrous and to have superior resistance to soap, humidity, salt spray, acids, and grease. Its heat resistance is claimed superior to any urea and melamine modified alkyd enamel.

It is generally applied by spraying and has a baking schedule of one-half hour at 420° F.

PLATERS

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS, WITH FULL CONTROL EQUIPMENT, AT REDUCED PRICES:

1—15,000/7500 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY** Latest DesignUnit, with Separate M. G. Exciter.
1—5000/2500 AMPERE, 9/18 VOLT, **CHARLES F. L'HOMMEDIEU** "RELIANCE" Units. Synchronous Motor Drive. Latest Design.
2—5000/2500 AMPERE, 6/12 VOLT, **A. P. MUNNING COMPANY** "OPTIMUS" Design, Separately Excited.
1—4000/2000 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY,** Compound Wound, Separately Excited.
1—2500/1250 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY,** Shunt Wound, Separately Excited.
1—2000/1000 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY,** Shunt Wound, Separately Excited.
1—1500/750 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY,** Shunt Wound, Separately Excited.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS COMPANY,** Separately Excited, Ball-bearing Design.
1—750 AMPERE, 9 VOLT, **HANSON-VAN WINKLE-MUNNING COMPANY** Interpole Construction, Latest Design.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON ELECTRIC CO.** Unit. Synchronous Motor Drive. Direct Connected Exciter.
4—1000/500 AMPERE, 6/12 VOLT, **CHARLES J. BOGUE ELECTRIC CO.** Separately Excited, Interpole Design.
1—1500 AMPERE, 40 VOLT, **HANSON-MUNNING,** Anodizing Synch. M. G. Set, Automatic Controls.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** Anodizing Synch. M. G. Set, Automatic Controls.
1—1000 AMPERE, 25 VOLT, **HANSON-VAN WINKLE-MUNNING COMPANY,** Separately Excited, Anodizing Unit.
OTHER SIZES OF ANODIZING M. G. SETS—in stock for Sulphuric or Chromic Acid Solutions—Large Selection. Write for details.
7—**G. E.** COPPER OXIDE RECTIFIERS, 500 AMPERE, 6 VOLT, for operation on 220/3/60.
ALSO NEW SELENIUM RECTIFIERS AS LOW AS $90.00.

M. E. BAKER COMPANY 143 SIDNEY STREET CAMBRIDGE, MASS.

But *Irons* and *Steels* Deserve JETAL BLACK

. . . the best protective and blackening finish available

JETAL is a tough, speedy "blackface" for your irons and steels. It is no thin skin of burnt cork illusion.

JETAL goes on fast, but it stays on. **JETAL** is better because it does more and costs less.

JETAL is a black oxide coating that is easily and inexpensively applied by immersion in less than 5 minutes.

JETAL is tough, long lasting and adaptable.

JETAL may be resistance or spot welded, and soldered.

JETAL will not chip, peel, crack, crumble or dust off, even on bending or cutting.

JETAL forms a fine base for lacquer, enamel or japan.

JETAL resists wear and penetration better than any black on the market.

JETAL is black **BLACK,** deep and solid.

JETAL does not change metals dimensionally after application.

JETAL costs less and can be applied by immersion in bulk, baskets or barrels.

JETOIL 1A

JETOIL 1A effectively guards against rust. As a supplemental oil film after JETAL coating, it protects during assembly, inspection, storage or in service; rust is not apparent until after more than 50 hours salt spray testing.

⬅ OTHER ALROSE FINISHES ➡

BLACK

Oxidine B — for blackening copper and brass.

Oxidine Z — for blackening zinc.

Bring your finishing problem to ALROSE for the best solution. Let ALROSE JETALIZE your sample product, or demonstrate the JETAL PROCESS in your plant.

WHITE

Bon White — an immersion tin finish for copper, brass or aluminum — exceptionally bright white — ideal soldering base.

Wite Brass plates a tertiary alloy of copper, zinc and tin, giving brilliant, non-tarnishing, long-wearing surface over all base or precious metals.

ALROSE CHEMICAL COMPANY

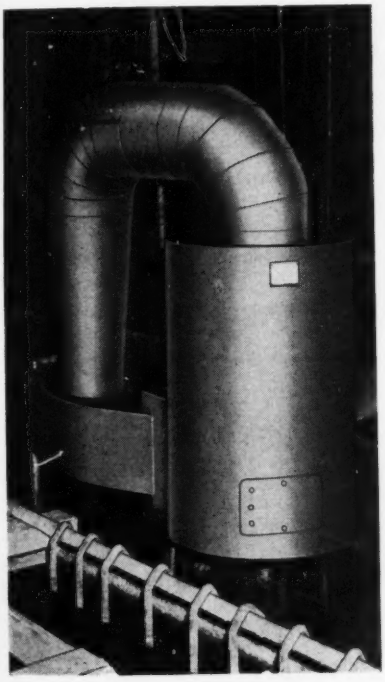
Manufacturing and Research Chemists

PROVIDENCE, RHODE ISLAND • WILLIAMS 3000

Both Zapon plants in Stamford, Conn., and in North Chicago, Ill., are already meeting manufacturing needs for dishwashing machines, sinks, stoves, hardware, and other articles.

New Fume Separator

A new *fume separator* which cleans contaminated air without the loss of room heat has been developed and is being placed on the market by the *Industrial Electroplating Company, Inc.*, 219 W. Vermont Street, Indianapolis, Ind.



The newly introduced fume control unit draws contaminated air off electroplating tanks, cleans it by water absorption and centrifugal separation, and returns pure air to the shop without wasting heat. The unit utilizes a minimum of ductwork, making installation and maintenance inexpensive.

The fume separator is the invention of two brothers, *Carl* and *William Niehaus*.

Two models are available, having capacities of 1500 cfm and 3000 cfm respectively. Each model is avilable with separating chambers of plain carbon steel or stainless steel.

A RECTIFIER *for* EACH TANK

Better Work... Lower Costs

Greater flexibility in handling varying jobs from tank to tank is assured by the installation of an R-A Selenium Rectifier for each tank. The finest voltage settings for the most difficult job in each tank can be set without overall loss of power. The complete installation is economical too.

Richardson-Allen Selenium Rectifiers are a great advancement in current conversion, engineered and built for long hard service. All units are tested at 25% continuous overload before leaving the factory.

Standard units available for immediate delivery. Write us today for data bulletins and the name of your nearest dealer. He will be glad to give you comparative cost figures on installation and operation.

Consider These Advantages:

1. Continuously variable stepless voltage control sealed in oil.
2. No lag in starting.
3. Adaptable for remote control.
4. Constant efficiency with varying loads.
5. No standby losses when not under load.
6. Internal forced cooling.
7. Thermostatic protection.
8. Units operate in room temperature up to 105° F.
9. Switches and pilot light on both basic and remote control units.

Rectification for Every Application

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Sales Engineers Located in Principal Cities

Manufacturers of the most complete line of standard Selenium Rectifiers

RICHARDSON-ALLEN

Selenium Rectifiers

Finishing Equipment

"*Despatch Finishing Equipment*," a 16-page bulletin, contains many articles and illustrations of ovens, dryers, air heaters, spray booths, and other finishing equipment. Write to *Despatch Oven Company*, Minneapolis 54, Minn., for *Bulletin 51*.

Aero Method in Ventilating

Advantages gained by applying aerodynamic principles to ventilator design are fully described in a new brochure of *G. C. Breidert Company*, 3129 San Fernando Road, Los Angeles 41, Calif. This illustrated booklet tells of the results in wind tunnel tests and in actual use on all types of installations. Free copies will be sent to those interested in this method of ventilation.

New Filter Book

The application of replaceable type air filters for ventilating and air-conditioning systems is explained in an eight-page booklet issued by *American Air Filter Company, Inc.*, 215 Central Avenue, Louisville 8, Ky. Descriptions and illustrations of each type filter are given, along with instructions for maintenance and detailed engineering and installation data.

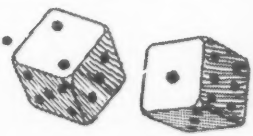
New Finishing Booklet

The publication of a new booklet of interest to all engaged in the manufacture or sale of magnesium products has been announced. Covering various phases of magnesium, the booklet is titled, "*Machining and Finishing Magnesium Castings.*" It is said to be completely factual and contains no advertising matter. Copies can be secured free upon request by writing to *Superior Magnesium Castings*, 140 Banker Street, Brooklyn 22, N. Y.

Centerless Grinder-Polisher

A new addition to the line of grinding and polishing equipment is now in production. Known as the *OD-1* cylinder grinder-polisher for rods, bars and tubes, it is a centerless machine using coated abrasive

DON'T GAMBLE...



SPECIFY HARRISON 4A

Buffing and Polishing COMPOUNDS- AND *Be Sure!*

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COMPOUNDS IN SIZES
150-180-220-240- 320

. . . Sure of the right compound for the right material. Sure, too, of the uniform, dependable quality built into every Harrison product for over 25 years.

For faster cutting, increased production, greater economy, specify Harrison 4-A Products. We will be glad to advise you on special problems and furnish samples of compounds that will meet your needs.

HARRISON & CO., INC. Dept. 1 **HAVERHILL, MASS.**

belts for grinding and polishing. It will remove up to 0.005 inch per pass on ferrous metals and up to 0.010 inch on nonferrous. Work supports will handle one-half inch bars up to 18 feet long and one inch bars up to 8 feet long. The endless abrasive belt is 4 inches wide, 60 inches long, and may be operated dry or wet with coolant. Wet operation is recommended as it gives better finish, does not discolor work from heat and gives a higher production with longer belt life. Two methods of feeding are employed; through feed, and end feed. The through feed is generally used and is accomplished by swinging the regulating wheel on its horizontal axis from zero to 12°. The rate of feed can be varied from zero to 18 feet per minute. Although just announced, the machine is not new, in that the first model was exhibited at the National Metal Congress in Cleveland in 1944. This machine has given more than three years of satisfactory service. It is now in production and on about four weeks' delivery basis. For further information write *Hammond Machinery Builders, Inc.*, 1608 Douglas Avenue, Kalamazoo 54, Mich.

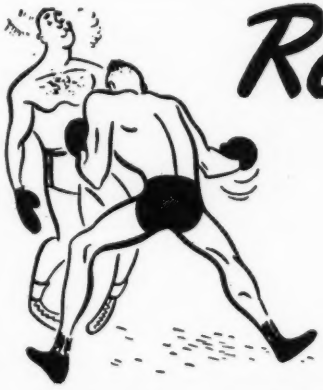
Foxboro Manufactures Dew Point Recorders

Dew Point Recorders and *Recording Controllers*, said to be the first simple, continuous dew point measuring instruments available for industrial use, are the newest additions to the line of industrial instruments offered by *The Foxboro Company*, Foxboro, Mass. They are the result of several years of research and development and extensive field-test installations. A considerable number are already in use.

Dew Point Recorders and Controllers are illustrated and fully described in *Bulletin 407*, of which copies will be sent on request.

Modernization Plan Now Completed by Zapon

To meet post-war demands for greater production of industrial finishes, the *Zapon Division* of the *Atlas Powder Company*, with plants at North Chicago, Ill., and Stamford, Conn., has completed a vast



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METAL PARTS WASHER

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NIAGARA METAL PARTS WASHERS

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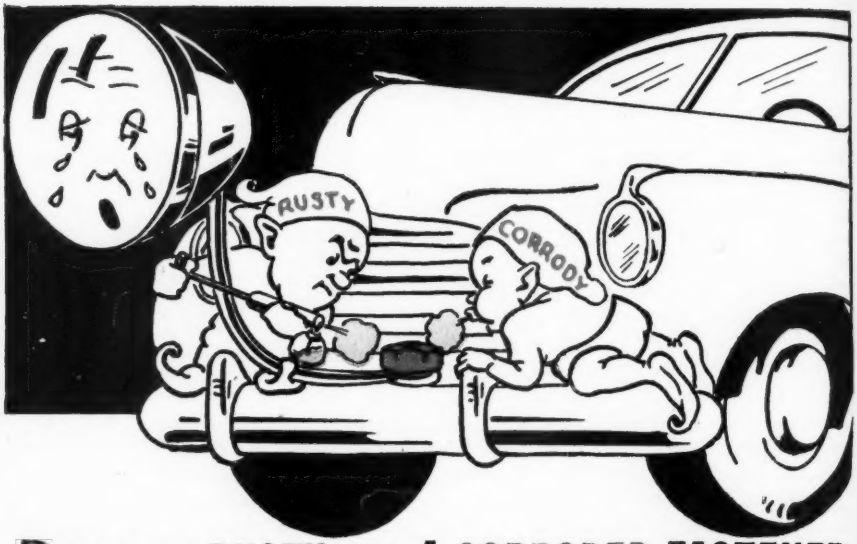

Does a RUSTY and CORRODED FASTENER spoil your product quality?

Rust and corrosion play hob with a product's quality when they're allowed to step in and go to work on untreated fasteners. If you're faced with this kind of a problem, then Luster-on* is your answer.

Nuts, bolts, screws or wing-nuts, basket or barrel zinc-plated and treated with Luster-on*, are permanently brightened, made positively rust- and corrosion-resistant. Once Luster-on* dipped, there's no danger of their spoiling the over-all beauty and utility value of your product.

Luster-on* gives fasteners of every kind a bright new lease on life. Send the coupon and a sample for processing today. See the results for yourself. There's no obligation.

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Please send me full particulars about Luster-on* bright dip for zinc-plated surfaces. I am (am not) sending sample for free dip. No obligation, of course.

Name_____

Firm_____

Address_____

Monthly Review December

modernization plan, according to *E. H. Bucy*, General Manager of the Division.

New equipment has been added, rebuilding has been done, and key floor plans rearranged so that all tend toward greater productivity with heightened laboratory control. Mr. Bucy pointed out that in order to accomplish this, concrete mezzanines were added so that solvents and resins could be piped directly from storage tanks to production areas by gravity flow.

Additional modern and up-to-the-minute facilities for pigment grinding were also installed, so that now the plant is equipped with late model number 3 roll-mills, steel-ball mills, and newest type Berylite mill.

MacDermid Opens West Coast Office

MacDermid, Incorporated of Waterbury, Conn., recently announced the opening of the Los Angeles, Calif., office and warehouse.

Mr. G. Stuart Krentel, former Chicago Manager, has been appointed West Coast Manager and can be reached at 1011 S. Los Angeles Street, Los Angeles 15, Calif. Telephone: Prospect 7754. A complete stock of *MacDermid cleaning compounds and MacDermid Bright Copper* supplies are carried in warehouse stock in Los Angeles for the convenience of West Coast clients.

Bulletin of Interest to Platers

La Motte Chemical Products Company, Towson, Md., offers a *Service Bulletin G-2-46* which describes briefly this company's control equipment for plating solutions. A variety of *p*H equipment is featured.

Dual Metal Wire Has Diverse Applications

An entirely new type of electroplated and drawn wire, "*Fernicklon*", manufactured by *Kenmore Metals Corporation*, 80 Broad Street, New York 4, N. Y., can be bent, swaged, hammered, or twisted without flaking. It has a wide range of manufacturing applications in such products as household utensils, tinsel wire, and numerous other items where finish and durability are important considerations. It eliminates the need for plating goods after fabrication.

Initial production includes steel wire with nickel, copper wire with nickel or silver, and die polish or satin finishes are available. Because of its surface perfection and absolute bond between its constituents, it can be subjected to severe climatic conditions when an anti-corrosive coating metal is used. It can also be welded to form a product without destroying the coating at the point of weld.

Data on Valves

A new bulletin published by *Hanna Engineering Works*, 1765 Elston Avenue, Chicago 22, Ill., gives specifications and operating data on all Hanna valves. The line consists of foot-operated and hand-operated valves for air and hydraulic lines, and speed control valves for use with air and hydraulic cylinders.

Latrobe Electric Steel Receives 1947 Achievement Award

Latrobe Electric Steel Company, Latrobe, Pa., has received the *1947 Special Achievement Award* made yearly by Materials and Methods magazine "for achievement in developing new engineering materials which result in higher production and lower cost of manufactured goods", the Company announces.

The award was made in recognition of Latrobe Electric Steel Company's development of *Desegatized* brand steels, in which segregation—a major handicap in tool steels—has been virtually eliminated.

Reports show superior toughness in Desegatized brand steels, ranging from 20 per cent to 200 per cent when compared in impact testing with non-dispersed segregate

PERMAG

the metal Surface Cleaner in Plating Shops and finishing departments where

- Efficiency
- Speed and
- Economy

are valued

PERMAG Cleaning Compounds have been serving the plating industry for a quarter of a century—and PERMAG is still giving highest satisfaction in cleaning metal surfaces prior to finishing.

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Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

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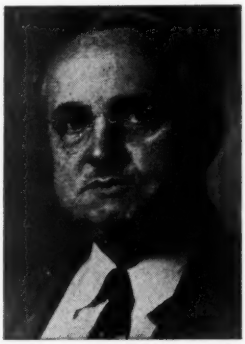
steels of similar grades. Statistics furnished by users of dispersed segregate tools and dies showed outstanding improvements in performance life.

Dr. Vinal Receives Navy Commendation

Dr. George W. Vinal, battery expert and chief of the *Electrochemistry Section of the National Bureau of Standards*, has been awarded the Certificate of Commendation by the Bureau of Ships of the Navy Department.



The Certificate of Commendation was granted for outstanding service to the United States Navy during World War II in development of new types of batteries and for Dr. Vinal's work with the Joint Army Navy Battery Advisory Committee of which he was secretary.

Dr. Vinal is internationally recognized for his research in the field of electrochemistry, particularly for his work in the development and perfection of the silver voltameter and the standard cell, which serve as standards for the international ampere and volt.

Quality Control

An 8-page booklet on quality control covering two subjects: "*Charts Help Diagnose Quality Progress*" and "*How To Analyze Production Rejects*" is offered by *North American Philips Company, Inc.*, 100 E. 42nd Street, New York 17, N. Y. Illustrated with drawings and tables, the subject matter is clearly presented and should be of interest to those wishing to improve quality control techniques.

Gwyer Joins H-VW-M

The *Hanson-Van Winkle-Munning Company*, Matawan, N. J., announces the appointment of *Eugene G. Gwyer* to its engineering staff. He will be located in Matawan, working in the Engineering Sales Department.

New Metal Finish

The *Mitchell-Bradford Chemical Company*, 2446 Main Street, Stratford P. O., Bridgeport, Conn., announces a new "*Finish No. 146*" which can be used as a clear corrosion-protective finish on plain or black-oxidized steel or as a tenacious undercoating on steel, aluminum, zinc base alloys, copper alloys, and magnesium for subsequent paint, lacquer, or enamel coatings.

The coating can be applied by dipping, spraying or brushing, and can be baked or air dried. It is available both clear and tinted.

It is also formulated in a water-displacing type, designated as "*Finish No. 146-W*".

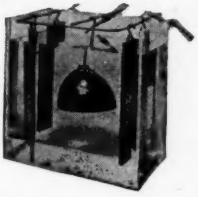
For further information write to the manufacturer.

Adjustable Anode Rods for Still Tank Equipment

The *Hanson-Van Winkle-Munning Company*, Matawan, N. J., announces the development of a new *adjustable anode rod* for use in alkaline solutions and also chromium plating baths which will permit more uniform plating of irregularly shaped parts in still plating tanks.

The new device consists of brackets welded or bolted to the tank wall to which steel

HIGH TEMPERATURE LUCITE PLATING TANKS for LABORATORY and PRODUCTION PLATING



Singleton tanks are made of high temperature Lucite to give unlimited life, resistance to all aqueous acids with no contamination even when changing from one bath to another, ruggedness, heat and electrical insulation, and transparency.

SEE THE BATH IN ACTION!

Our Singleton Production Tank, a Lucite tank within a steel tank, is the ideal, permanent answer to your plating problems at no higher cost.

LINERS FOR YOUR PRESENT TANKS

Everything in Plastics for the Platers

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PLATING GENERATORS

1–3000 Amp., Electric Products Co.

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Late model, double commutator interpole type. Motors 220/440 or 550, 3 phase, 60 cycle.

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Start with a *Good Finish*

Cleaning Compounds formulated by The Puritan Manufacturing Company provide platers with the necessary requirements for satisfactory plating. PURICO Compounds eliminate superfluous operations . . . save time and labor . . . minimize rejections . . . speeds up production.

Wonderbar

A pre-saponified Tripoli bar composition for economical buffing. Soluble in mild alkali, Wonderbar rinses from intricate patterns without requiring degreasing machines. *Makes tedious manual scrubbing unnecessary.*

Pur-Bur

Solves the tough and complex burring problem. Applied to the wheel, Pur-Bur is self-lubricating to prevent friction, embrittlement, or burned surfaces. Possesses high cutting qualities for rapid removal of burrs and fins without dangerous results.

Purico ZN

A black oxide finish that provides a lustrous black, long-lasting finish on Zinc products. Penetrates directly into the metal to eliminate the danger of chipping or flaking.

THE *Puritan*
MANUFACTURING COMPANY
WATERBURY, CONNECTICUT

plates or arms, insulated on either side with Phenol fiber, are pivotally attached. At the outer end of these arms are swivel fittings on which are mounted annular clamps containing insulators which surround and support the anode rod. These insulators, formed in two halves, are easily installed and clamped in place around the rods, while the ball anode holders or straight elliptic anodes, as the case may be, are supported by the rod. This rod is of sturdy, simple design, capable of supporting several hundred pounds of anode material which can be moved to any desired position with a minimum of effort.

Electric current is supplied by means of a flexible cable attached to one end of the rod, while an insulated handle is provided at the other end to permit adjustment as needed.

Lead Anodes

Special Divco 71-Point Lead Anodes, 12 feet long with special high conductivity hooks, for chromium plating long sections

of tubing and pipe, are made by *Division Lead Company*, 836 W. Kinzie Street, Chicago 22, Ill. In addition to the high efficiency and great throwing power of the 71-Point Design, it is claimed that the deep-ribbed construction minimizes buckling and warping. Special and Conforming Anodes, as well as standard anodes, are manufactured using the 71-Point Design.

"YANKEE BRAND"

PROGRESSIVELY BETTER ABRASIVE COMPOUNDS

Tailored to fit all finishing requirements.

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CUT DOWN REJECTS
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ORVUS

IN YOUR METAL CLEANING BATHS

You'll find this synthetic detergent effective
—as a wetting agent
—as an emulsifier
—in dispersing lime soaps which might cause poor plating if allowed to deposit on the metal

Write for further information about Orvus to

PROCTER & GAMBLE, Cincinnati 2, Ohio

New Zapon One Coat Hammer Line Now Complete

An improved one coat hammer line has recently been completed by the *Zapon Division* of the *Atlas Powder Company*, and is now ready for merchandising, according to *Don Metz*, assistant general sales manager of the firm's Stamford office.

This new product finish, available in bright, cheery colors, can be had in quantities from five gallons to unlimited amounts, ready to spray.

According to Mr. Metz, this material can be sprayed with a minimum one coat pass because of the excellent coverage it affords. By the addition of special thinners the hammer effect may be cut back by the customer himself to produce a smooth surfaced, high gloss finish. Through the use of careful masking and drying it can be used to attain a two-tone effect.

Hinderliter Tool Company Acquires "Nail-it" Manufacturing Rights

The *Hinderliter Tool Company Division* of the *H. K. Porter Company, Inc.*, Tulsa, Okla., announces its acquisition of all manufacturing rights for "*Nail-It*" *Pipe Couplings*, *Swivel Joints*, and *Pump Suction Couplings*.

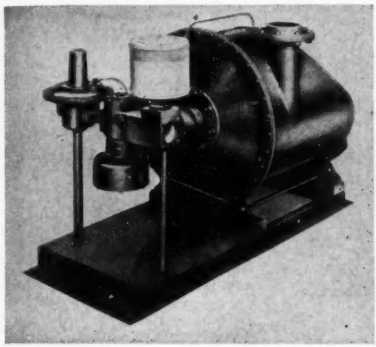
Manufacture of these products will begin immediately at the Hinderliter's Tulsa works under the new trade name of "*Nail-It-Kwik*".

This new coupling principle and sealing method is very unique and is said to be the fastest type of coupling yet devised. The halves of the unit are coupled by driving common nails into mating grooves in the male and female ends and are uncoupled by merely pulling the nails. Two or more nails are used on each coupling to form a removable steel shear ring of greater strength than a regular line pipe joint.

Oil-and-wear resistant synthetic "*O*"-*Ring Gaskets* form pressure tight seals in "Nail-It-Kwik" products. No mechanically applied compression is necessary to effect a seal, and scarring or abrasion of the sealing surfaces will not cause leakage, as the "O"-Rings seal between, not on, mating surfaces.

New Gas-Air Mixer Permits Visible Operation

A completely new *Gas-Air Mixer* that permits such features as visible operation has been perfected for the industrial gas field by a Chicago gas engineering concern. The Mixer is designed to pre-mix any commercial gas—natural, manufactured, or liquid petroleum gases—with air in any desired proportion and in any desired quantity within the capacity of the unit. This mixture is then delivered to the burners under constant pressure.



With this Mixer, accurately controlled combustion mixtures are assured for all types of heating processes. Extremely close temperature control, high heat input, practically unlimited turn-down range, high burner pressure and any desired flame characteristic are stated to be features of the new mixer.

At present the several models provide mixture capacities from 3,000 to 18,000 cubic feet per hour, with larger sizes planned for future production. Discharge pressures range from 28 to 32 ounces, with uniform 3500 rpm for all five models.

Those interested can obtain the illustrated *Bulletin No. 825* by writing the manufacturer, *Gas Appliance Service, Incorporated*, 1211 Webster Avenue, Chicago 14, Ill.

Plastic Flooring

A color folder about *Plastile*, the new laminated vinyl floor tile, made from tough *Tygon* plastic, which has served industry for years, may be had by writing to *U. S. Stoneware Company*, Akron 9, Ohio.

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ANY QUANTITY
ALL SIZES

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ANODE BAGS

Robins' all nylon anode bags made of TOUGH du Pont chemically resistant nylon offer important advantages:

☆ **TEAR RESISTANT**
3 to 4 times tensile strength and elasticity of cotton

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continuous service up to 300° F.

☆ **EASILY CLEANED**

☆ **NON ABSORBENT**

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Unaffected by alkalies

Prompt shipment on standard and special sizes.
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BALTIMORE-WASHINGTON meets first Tuesday of each month in October, December, February and April at the National Bureau of Standards, Washington, D C , and in November, January, March and May at American Hammered Piston Ring Company, Baltimore, Md. Secretary, Grace Riddell, Chemistry Division, National Bureau of Standards, Washington 25, D C.

BOSTON meets first Thursday of each month in Hotel Statler, Boston, Mass. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass.

BRIDGEPORT meets first and third Friday of each month in Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony Street, Bridgeport 8, Conn.

BUFFALO meets second Friday of each month in Markeen Hotel, Buffalo, N. Y. Secretary, H. A. Fodeman, 534 W. Ferry Street, Buffalo 13, N. Y.

CHICAGO meets second Friday of each month at 8 P. M., in Atlantic Hotel. Sec y-Treas., J. M. Andrus, 3701 Ravenswood Ave., Chicago 13, Ill.

CINCINNATI meets on fourth Wednesday of each month at 8 P. M., in Engineering Society Headquarters, McMillan Street and Woodburn Avenue, Cincinnati Ohio. Secretary-Treasurer, L. M. Rasmussen, 3228 Brotherton Rd., Cincinnati 9, Ohio.

CLEVELAND meets first Friday of each month in Cleveland Hotel, at 8 P. M. Secretary-Treasurer, George B. Svenson, 2059 Hamilton Avenue, Cleveland 14, Ohio.

COLUMBUS meets first Friday of each month in Battelle Memorial Institute Auditorium, 505 King Avenue, Columbus 1, Ohio, at 8 P. M. Sec'y-Treas., Bernard; Agruss, 505 King Ave., Columbus 1, Ohio

DAYTON meets second Friday of each month in Engineers' Club, Dayton, Ohio. Secretary Treasurer, Elmar W. Rehme, 505 Commercial Bldg., Dayton 1, Ohio.

DETROIT meets first Friday of each month in Hotel Statler. Secretary-Treasurer, F. L. Clifton, 16536 Inverness, Detroit 21, Mich.

GRAND RAPIDS meets second Friday of each month, 7:30 P. M., in Rowe Hotel. Secretary, Jacob M. Hage, 1327 Jefferson Ave., S. E. Grand Rapids, Mich.

HARTFORD meets third Monday of each month in Hotel Bond, Hartford, Conn. Secretary, A. J. Dankevich, 63 Massachussetts Ave., New Britain, Conn.

INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 Washington Street. Secretary-Treasurer, James J. Monagle, 1464 N. Colorado Ave., Indianapolis, 1, Ind.

JACKSON-LANSING meets second Tuesday of each month at Home Dairy Company in Lansing. Secretary-Treasurer, U. J. Forsyth, 1816 Ada Street, Lansing 10, Mich.

LANCASTER meets second Friday of each month, at 8 P. M., in Thaddeus Stevens Industrial School, Lancaster, Pa. Secretary-Treasurer, H. Clay Brubaker, 881 Manor Street, Lancaster, Pa.

LOS ANGELES meets second Monday of each month at 6:30 P. M. Secretary, Dean D. Williams, 2728 W. 42nd Street, Los Angeles, Calif 2728 W. 42nd St., Los Angeles 43, Calif.

MELBOURNE, AUSTRALIA. Secretary, L. A. Francis, G. P. O. Box 4502.

MILWAUKEE meets first Friday of each month in Red Arrow Club, 774 N. Broadway. Secretary-Treasurer, James Durnford, 64 Eastman St., Oconomowoc, Wisc.

MONTREAL meets first Tuesday of each month in Mount Royal Hotel, Montreal, Quebec, Canada. Secretary-Treasurer, William L. Glover, 754 Second Avenue, Verdun 19, Quebec, Canada.

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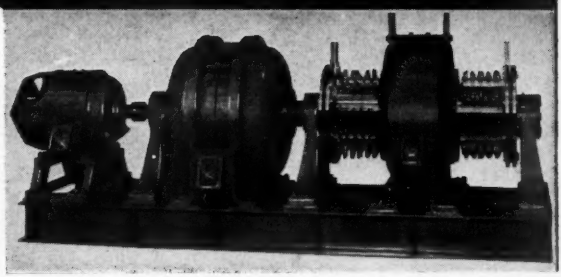

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LETTER FROM THE EDITOR

December 1, 1947

Dear Reader--

This is literally and actually the last page of THE MONTHLY REVIEW. As was announced in last month's editorial columns, the January 1948 issue of this publication will bear the title of PLATING. PLATING will be larger in page size than THE MONTHLY REVIEW and will be distinctively styled with a new format. It will be easier to read, too, because it will have larger type in the text matter.

The decision to enlarge the size of the publication was made several years ago, but the war, with its corresponding paper shortage, prevented carrying out the plan. January 1948 offered the first practical opportunity for this change.

Active planning for the new publication has been under way for over a year. There have been an untold number of staff conferences. Outside authorities in the plating and publishing fields have contributed generously with good advice. All who have seen the advance "lay-out" of the new format have spoken enthusiastically of it.

We feel confident that our readers will receive the "new look" of PLATING with enthusiasm. The same high quality, factual editorial content that has characterized THE REVIEW will form the basis of PLATING. Interesting and useful new features will be added in coming months. And in the same manner that an electroplater adds a pleasing appearance to a finished product, we are attempting to make our "editorial package" as attractive as possible.

Sincerely,

Gustaf Soderberg

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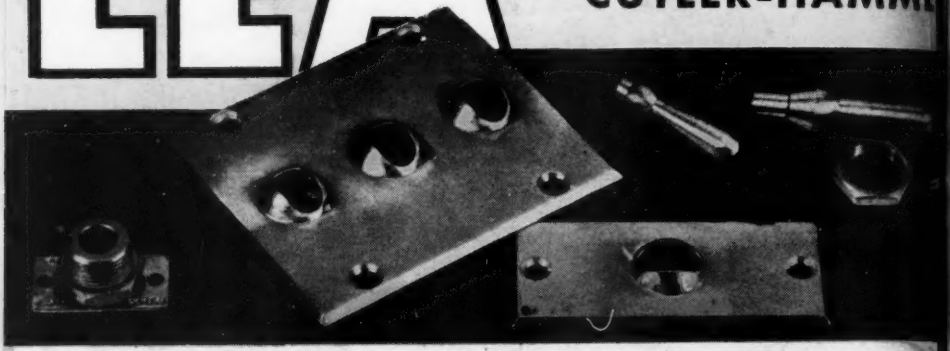

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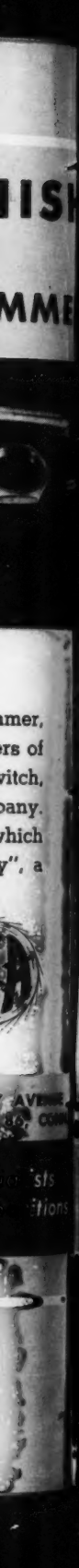
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